Environmental, Safety, Health, and Emergency Response Plan

REMOVAL OF THE ABOVE GROUND PORTION
OF THE BGRR PRIMARY AIR COOLING DUCT
BROOKHAVEN NATIONAL LABORATORY

Work Performed Under Contract To:

BROOKHAVEN SCIENCE ASSOCIATES
Brookhaven National Laboratory
Upton, New York 11973

URS - DAMES & MOORE

SITE-SPECIFIC HEALTH AND SAFETY PLAN AND WORKPLACE HAZARD ASSESSMENT

Project Name and Number	Removal of the Above Ground Portion of the BGRR Primary Air Cooling Duct 30822-286-023
Project Site Location:	Brookhaven National Laboratory Upton, NY 11973
Project Manager:	Eric Goller
Site Industrial Safety Officer:	Christopher Fisher
Plan Preparer:	Larry W. Luckett, CHP
Preparation Date:	June 8, 2000

HEALTH AND SAFETY PLAN APPROVAL AND CERTIFICATION THAT WORKPLACE HAZARD ASSESSMENT HAS BEEN PERFORMED (29CFR1910.132):

_____

Radiological Health and Safety Manager
Larry W. Luckett, CHP Date: _____

_____

Industrial Health and Safety Coordinator
Christopher Fisher Date: _____

_____

Managing Principal, DOE Programs
William P Duggan, Phd, CHP Date: _____

Plan Health and Safety Approval Number
NYK-EG-060800

_____

Project Manager
Eric Goller Date: _____

ENVIRONMENTAL, SAFETY, HEALTH AND EMERGENCY RESPONSE PLAN
BGRR ABOVE GROUND DUCT REMOVAL

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ACRONYMS AND ABBREVIATIONS

ALARA	As Low As Reasonably Achieveable
ANSI	American National Standards Institute
BNL	Brookhaven National Laboratory
BGRR	Brookhaven Graphite Research Reactor
CFR	Code of Federal Regulations
CGI	combustible gas indicator
CHP	Certified Health Physicist
cpm	counts per minute (units for uncorrected detection of radiation)
CRZ	Contamination Reduction Zone
dBA	decibels auditory (A-weighted sound level units)
DEET	diethyltoluamide, the active ingredient in many insect repellants
dpm	disintegrations per minute (units for efficiency-corrected detection of radiation)
DOE	Department of Energy
DOT	Department of Transportation
EMS	Environmental Management System
ESH&Q	Environmental, Safety, Health and Quality
ESHERP	Environmental, Safety, Health, and Emergency Response Plan
EZ	Exclusion Zone
HAZWOPER	Hazardous waste operations and emergency response
HCS	Hazard Communication Standard, the OSHA Hazard Communication Standard is found in 29 CFR 1910.1200 and 29 CFR 1926.59
IDLH	Immediately Dangerous to Life and Health
IDW	Investigation Derived Waste
LEC	Local Emergency Coordinator
LRCT	Lead Radiological Control Technician
MSDS	Material Safety Data Sheet
NIOSH	National Institute of Occupational Safety and Health
NRC	Nuclear Regulatory Commission
NRRPT	National Registry of Radiation Protection Technologists
OSHA	Occupational Safety and Health Administration
PHSM	Project Health and Safety Manager
PID	photoionization detector for the monitoring of volatile organics
PM	Project Manager
PPE	Personal protective equipment
QAPP	Quality Assurance Project Plan
RCD	Radiological Control Division, BNL
RWP	Radiological Work Permit
SBMS	Safety Based Management System (BNL)
SCBA	Self-contained breathing apparatus
SHSD	Safety and Health Services Division, BNL
SISO	Site Industrial Safety Officer
SMS	Safety Management Standard (URS)
TLD	Thermo-luminescent dosimeter
VOC	Volatile organic compounds
WMD	Waste Management Division, BNL

Removal of Above Ground Portion
of the BGRR Primary Air Cooling Duct Project

URS - DAMES & MOORE
ENVIRONMENTAL, SAFETY, HEALTH, and EMERGENCY RESPONSE PLAN

1.0 PURPOSE

The purpose of this Site-Specific Environmental, Safety, Health and Emergency Response Plan (ESHERP) is to assign responsibilities, to establish personnel protection standards and mandatory safety practices and procedures, and to provide for contingencies that may arise during site operations of the BGRR Above Ground Ducts Removal Project at Brookhaven National Laboratory (BNL). This ESHERP, along with information referenced in the Project Comprehensive Work Plan, the BNL *Standards Based Management System* (SBMS) and the URS-Dames&Moore Group *Health and Safety Standards Management Program*, are intended to provide information and policies for the following required plans and programs:

- The written safety and health program for employees involved in hazardous waste operations (29 CFR Part 1910.120),
- The certification that a workplace hazard assessment has been performed (29 CFR 1910.132),
- The respiratory protection program (29 CFR 1910.134),
- The radiation protection program (10 CFR 835) and quality assurance program (10 CFR 830.120)

1.1 BNL Environment, Safety and Health Requirements

This ESHERP supplements the BNL SBMS that contains and the requirements for operations at the laboratory site. The project, URS-Dames&Moore Group and its subcontractor personnel shall operate within requirements of the BNL SBMS policies and procedures, in addition to the project specific information provided in this supplement. The BNL Work Planning and control System and the ISO14001 Standard incorporate five core functions from Integrated safety management:

- Define the scope of work,
- Analyze the hazards,
- Develop and implement hazard controls,
- Work within the controls, and
- Provide feedback and continuous improvement.

The controlled copy of the BNL SBMS is available on the web at [https://sbms.bnl.gov].

1.2 URS-Dames&Moore Safety and Health Standards

URS-Dames&Moore has published an extensive corporate safety procedures compilation in the URS-Dames&Moore Group *Health and Safety Standards Management Program*, June 1999. These procedures will be followed by personnel working in the BGRR Above Ground Duct Removal Project. A compilation of the project-specific Safety Management Standards is provided in Attachment 1. A copy of this computer-based document will be available on site at the URS-Dames&Moore Administrative Location.

1.3 BGRR Above Ground Ducts Removal Project ALARA Policy

URS-Dames&Moore management is committed to the ALARA principles of keeping radiation exposure to employees and the general public as low as is reasonably achievable commensurate with sound economic and societal considerations. The foundation of a strong ALARA program is the inclusion of the ALARA philosophy in every aspect of every task involving potential radiation exposure. URS-Dames&Moore personnel will assign a high priority to procedural changes and work plans that will reasonably reduce personnel and environmental exposure, in accordance with the BNL institution radiological control procedures.

1.4 Environmental Management System

The Brookhaven Graphite Research Reactor Decommissioning Project (BGRR-DP) is in the process of implementing the ISO14001 Environmental Management System (EMS) with the BNL Environmental Restoration Division. Before completion of the Above Ground Ducts Removal Project, the Laboratory will be seeking registration to the standard. URS-Dames&Moore personnel will complete EMS training and shall comply with the BGRR-DP EMS requirements.

The BGRR-DP EMS process identified the following Environmental Aspects that are associated with the scope of work by URS-Dames&Moore:

Significant Aspects
Radioactive Waste Generation
Hazardous Waste Generation
Regulated Industrial Waste Generation

Potential Significant Aspects
Atmospheric Discharges
Soil Contamination

To manage these Aspects, operational controls, maintenance plans, legal and other requirements, records, responsibilities, and job-specific training have been established. Conformance to these requirements shall be incorporated into technical work documents and the overall work planning and control system.

2.0 APPLICABILITY

The purpose of this ESHERP, which was developed specifically for the BGRR Above Ground Ducts Removal Project operations at the BNL site located in Upton, New York, is to assign responsibilities, establish personal protection standards and mandatory environmental, safety and health procedures, and provide for contingencies that may arise while operations are being conducted at the site. This plan complies with, but does not replace:

1. Federal Health and Safety Regulations as set forth in 29 CFR 1910 and 1926;
2. New York State Department of Health safety regulations and guidance established by the New York State Department of Environmental Conservation;
3. Department of Energy Rules for Occupational Radiation Protection, 10 CFR 835;
4. Department of Energy Order, *Environmental Protection, Safety and Health Protection Standards*, DOE 440.1;
5. Department of Energy Order, *Worker Protection Management for DOE Federal and Contractor Employees*, DOE 440.1A;
6. BNL *Radiological Control Manual*, Rev. 3, and associated implementing procedures;
7. NRC Regulatory Guide 8.10, *Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As is Reasonably Achievable*;
8. BNL Standards Based Management System;
9. Dames & Moore Group *Health and Safety Program and Management System*, June 1999;
10. Suffolk County Department of Health, Article 12.

Applicable portions of these standards and guidelines are incorporated into this ESHERP by reference, as noted. This plan is to be used by the URS-Dames&Moore personnel and URS-Dames&Moore subcontractors as a supplement to such rules, regulations, and guidance.

Changing and/or unanticipated site conditions, changes in regulatory requirements, or changes in site specific guidance documents may require modification of this plan in order to maintain a safe and healthful work environment. Any proposed changes to this plan shall be reviewed and approved with the Project Health and Safety Manager (PHSM), or his designee; the BGRR Project Manager; and the BGRR ESH&Q Manager, prior to their implementation. Under no circumstances will modifications to this plan conflict with BNL, Federal, state, and local health and safety or radiological control regulations.

The provisions of this ESHERP and the BNL SBMS are applicable for all individuals (BNL personnel, URS-Dames&Moore employees, U.S. Ecology employees, and for other URS-Dames&Moore

subcontractor employees) who are engaged in project activities including, but not limited to, initial site reconnaissance, preliminary field investigations, mobilization, project operations, and demobilization.

URS-Dames&Moore will require the following environmental, safety, and health requirements from its employees, U.S. Ecology employees and other subcontractors:

- Project personnel must have current, appropriate generic training [i.e., a 40-hour HAZWOPER health and safety course for hazardous waste work, or certified equivalent training (29 CFR 1910.120)] and BNL site-specific training in radiation protection [Rad Worker I and additional courses]. A detail training matrix is provided in Section 13, below.
- Personnel working on-site must have had an annual physical (or physician's waiver for biennial physical) and be certified "fit for duty" or "fit for respirator use," if necessary, by a qualified physician.
- URS-Dames&Moore will require each individual to provide proof of both training and a physical evaluation before site work may begin.
- Personnel must have appropriate personal protective equipment (PPE) for the specific job. The the USR Project Health and Safety Manager will determine what level of protection is appropriate for each area of activities for concurrence by BGRR ESH&Q Manager prior to commencement of operations. Any changes in the required PPE will be based on monitoring data and will be subject to approval by the Project Health and Safety Manager, the BGRR Subcontractor Technical Representative, and the BGRR ESH&Q Manager.
- Field operations must meet applicable safety standards and satisfy URS-Dames&Moore's field inspection. Unsafe equipment or operations will require evaluation and/or correction prior to resumption of operations.
- Project subcontractors must certify compliance with this ESHERP by submitting a signed Subcontractor Statement of Compliance (See Attachment 2)
- Project individuals must complete and sign the Safety Plan Compliance Agreement (see Attachment 3) after reviewing this Site Specific ESHERP and the BNL Work Permit.

This ESHERP is a controlled document and can be changed if necessary due to project needs. All changes will be technically reviewed, approved and re-issued in accordance with URS-BGRR-TP-00-01, *Document Control for the BGRR Above Ground Duct Work*. All changes will be carefully documented and kept with on site copies of the ESHERP. The URS-Dames&Moore Project Manager will distribute changes to project personnel and subcontractors and will provide a copy of the document to the BGRR Subcontract Technical Representative. All changes will be updated and posted by at least the end of each week. All changes to this plan shall also result in a review of the work plan to insure uniformity with documentation and then a health and safety prejob briefing update.

3.0 PROJECT AND SITE DESCRIPTION

3.1 General Information

The Removal of the Above Ground Ducts (AGDs) at the Brookhaven Graphite Research Reactor (BGRR) is a CERCLA time-critical removal action, and is one phase of the over-all decommissioning of the reactor and its support facilities. The inside of the BGRR AGDs are only radiologically contaminated; the outside is covered with a coating that contains non-friable asbestos, lead, and Aroclor (a poly-chlorinated biphenyl or PCB), but no radiological contamination. The levels of contamination reported by BNL are discussed below. These ducts must be removed because they pose an environmental risk.

3.1.1 Project Overview. URS/Dames&Moore will provide construction services to include providing all labor, materials, and equipment to:

- Remove the Above Ground Ducts from the first expansion joint above the ground eastward over the Fan House roof to the end of the duct.
- Install a suitable cover to seal the remaining two ducts from weather intrusion (specs to last 2-4 years)
- Install a suitable cover, equivalent to permanent roofing, to seal the eight duct openings from weather intrusion in the roof of Building 704
- Segment the duct work for transportation to offsite processing and disposal of the material.
- Provide transportation of the radioactive materials generated at BNL and at the off-site processing facility to the designated disposal site.

3.1.2 Site Location. The site is located near the intersection of Rutherford Rd and Lawrence Dr, at Brookhaven National Laboratory, Upton, NY. See Site Location Map, provided in the Project Work Plan.

3.1.3 Proposed Timeframe of Project. URS-Dames&Moore mobilization to the site is scheduled for May, 2000 to support a completion date no later than August 31, 2000.

3.2 Description of Above Ground Ducts.

The Above Ground Duct is constructed of reinforced concrete. The duct has a rectangular cross-section with wall thickness of 9 inches. The cross section size of the duct varies from 12' by 12' square to 8' wide by 6' high. Approximately 130' of the duct are located on the Building 704 Fan House roof. The remaining 99' are at an angle and attach to below ground duct at an expansion joint.

3.3 Description of Chemical Hazardous Constituents

The coating on the exterior of the duct contains the hazardous materials lead, asbestos, and PCBs. The exterior surface area of the duct is approximately 10,000 square feet. The following table provides analytical results of samples obtained from the duct exterior.

Table 1. Hazardous Materials in the AGD Exterior Coating

Location	Lead ppm	Arochlor ppm	Asbestos
Seg. 1-s. side of duct - 12' from 1st joint - 3' from duct bottom	25.6	0.329	7% non-friable
Seg. 3-s. side of duct - 10' E of joint - 21/2-3' from duct bottom	21.7	115.0	
Seg. 4-s. side of duct - 0-12" E of Joint- 0-2' above pedestal	27.0	252.0	
Seg. 4-s. side of duct - 0-12" W of Joint- 0-2' above pedestal	24.1	89.0	
Seg. 1-N. side of duct - 4-5' from W Joint 2-3' from duct bottom	9.5	121.0	

Source: BGRR Above ground Duct Bid Specifications

3.4 Description of Radioactive Material Constituents.

The interior of the duct surface is the bare concrete that has been contaminated with radioactive materials. The levels, types and amounts of radioactivity have been measured by sample analysis and by *in situ* gamma spectroscopy.

Table 2a. Radioactive Materials detected *in situ* on the AGD Interior Walls

Radionuclide	Plug Surface	North Duct Wall	South Duct Wall	Rooftop Duct Wall
	Activity Surface Concentration (pCi/cm^2)			
Am-241	37 ± 13	13 ± 2	21 ± 24	15 ± 21
Cs-137	8,500 ± 260	10,400 ± 710	24,100 ± 1,600	13,700 ± 930
Co-60	ND	ND	34.6 ± 4.4	26 ± 4.3
Eu-152/154	ND	2.3 ± 2.0	2.7 ± 3.3	ND

Note: ND - Not detected

Uncertainties represent counting errors (2ó)

Source: BGRR Above Ground Duct Bid Specifications

Table 2b. Radioactive Material Expected in the Duct Surface from Analysis of Downstream Dusts

Radionuclide	Surface Activity pCi/cm^2	Total Activity Ci
Am-241	21.0	1.90E-04
Pu-238	0.055	5.01E-07
Pu-239	27.0	2.45E-04
Pu-240	27.0	2.45E-04
U-233	3.03	2.75E-05
U-234	3.03	2.75E-05
U-235	0.0065	5.89E-08
U-238	0.072	6.48E-07
Sr-90	4,050.	3.67E-02
Y-90	4,050.	3.67E-02

Source: BGRR Safety Evaluation, BGRR-SE-99-04, Rev 0, May 9, 2000

3.5 Description of Radiation Levels in the Duct Environs.

Table 3. Radiation Levels Measured During Duct Entry on the Fan House Roof

Location	Beta/gamma Exposure Rate (mR/hr)	Beta Dose Rate (mrad/hr)
Contact on inner surfaces	0.2 - 2.0	2.0 - 8.0
MAXIMUM on Contact	4	25
General Area	0.4 - 0.8	not measured

Source: BGRR Surveys performed during entries to the above ground portions of the air ducts.

4.0 RESPONSIBILITIES

Each individual working on the BNL BGRR Above Ground Ducts Removal Project is responsible for adherence to the environmental, safety and health requirements of this document, and every worker has the authority and the responsibility to enforce its provisions. This authority includes issuing an order to "stop work" if circumstances warrant. Work will be resumed in accordance with the BNL Stop Work Procedure. The "Stop Work' authority is discussed in more detail in Section 9.1, below.

4.1 Key Personnel

! Nuclear Program Manager	URS-Dames&Moore	William P Duggan, PhD, CHP
! Project Manager	URS-Dames&Moore	Eric D. Goller, P.E.
! Site Supervisor	URS-Dames&Moore	William Jones
! Operations Manager	U.S. Ecology Inc.	Neal Whatley
! Project Health & Safety Manager	URS-Dames&Moore	Larry W. Luckett, CHP
! Site Industrial Hygiene Officer	URS-Radian	Christopher Fisher
! Lead Radiological Control Tech	URS-Dames&Moore	Robert Stone, NRRPT
! Quality Assurance Manager	URS-Radian	Ken Kaufman
! Project Engineer	URS-Radian	Ralph A. Fasano, PE

4.2 URS Project Organization

The URS organization chart for the BNL BGRR Above Ground Ducts Removal Project is provided in Figure 1. This contract effort is being performed for BNL by URS Corporation as the prime contractor through two corporate subsidiaries: URS-Dames&Moore as lead with support from URS-Radian. Significant portions of the waste processing and volume reduction of the ducts are being performed by a teaming partner/sub-contractor, U.S. Ecology, Inc. Health and Safety responsibilities for individuals in the organization are specified in the following paragraphs.

4.2.1 URS-Dames&Moore Nuclear Program Manager. The URS-Dames&Moore Nuclear Program Manager provides corporate overview and cognizance to URS-Dames&Moore nuclear field projects. The Nuclear Program Manager has the knowledge and experience of corporate organization, policies and operating practices to ensure that appropriate and sufficient assets are made available for the timely performance of the contract obligations. The Nuclear Program Manager will coordinate with BNL project management personnel for timely feedback on project expectations and performance. The Nuclear Program Manager will ensure that URS-Dames&Moore standards for Health and Safety and Quality Assurance are implemented in the project execution.

4.2.2 URS-Dames&Moore Project Manager. The Project Manager (PM) shall direct on site operations. The PM may delegate all or part of these duties to a properly-qualified individual who is designated as the Site Supervisor. At the site, the PM, assisted by the Project Safety and Health Manager, has primary responsibility to:

a. See that appropriate personal protective equipment and monitoring equipment is available and properly utilized by all onsite personnel;

b. Document that site personnel are aware of the provisions of this plan, are aware of the provisions of the BNL SBMS, are instructed in the work practices necessary to ensure safety, and are familiar with planned procedures for dealing with emergencies;

c. Document that all onsite personnel have completed a minimum of 40 hours of HAZWOPER/health and safety training, have appropriate medical surveillance and have been fit tested for the appropriate respirators;

d. Document that all onsite personnel who will be working in areas that are known to contain or are suspected of containing radioactive material or contamination are qualified, as set forth in 10 CFR 835, and that individuals have received additional BNL training appropriate to their duties (see Section 13, below);

e. Ensure that site personnel are aware of the potential hazards associated with site operations;

f. Monitor the safety performance of all site personnel to see that the required work practices are employed;

g. Correct any work practices or conditions that may result in injury or unnecessary exposure to hazardous chemicals or radioactive materials;

h. Prepare and submit to the BNL/BGRR Subcontractor Technical Representative any Radiological Awareness Reports, accident/incident reports or Occurrence Reports, as applicable;

i. See to the completion of the Safety Plan Compliance Agreement forms by all site personnel (See Attachment 2 and 3);

j. Stop Work, if necessary, in the event of an emergency or to correct unsafe work practices;

k. In conjunction with BGRR-DP management, review and approve changes to this project ESHERP;

l. Notify the BGRR Subcontractor Technical Representative in the event of any non-conformance with ES&H requirements.

4.2.3 URS Project Health and Safety Manager

a. Implement this project ESHERP and report any deviations from the anticipated conditions described in these documents to the PM. Primary implementation is through supervision of two

safety individuals on the project: the Site Industrial Safety Officer and the Lead Radiological Control Technician. Responsibilities of these individuals are specified in subsequent sections.

b. Ensure that a copy of this ESHERP and the Dames & Moore *Health and Safety Program and Management System* are located onsite at all times.

c. Maintain a chemical inventory list and material safety data sheets (MSDS) for all hazardous chemicals brought onsite by contractor personnel.

d. Review monitoring results, observe trends in personnel and workplace monitoring results, and evaluate the need for increases in personal protective equipment or modified work procedures associated with previous and current exposure results.

e. Report unusual observations from monitoring data, and assist BNL with the preparation of reports, e.g. Non-conformance Reports, ORPS RARs, etc., related to project activities.

f. Maintain the project OSHA Form 200, "Log and Summary of Occupational Injuries and Illnesses". Periodically provide OSHA Form 200 to BGRR Subcontractor Technical Representative for use in internal and DOE reporting requirements.

g. Maintain all environmental, safety, health and radiological control records as described in Section 13.8 until relinquished to BNL upon project completion.

4.2.4 URS Site Industrial Safety Officer (SISO)

a. Conducts hazardous contaminant monitoring as discussed in Section 6, below. Ensures that monitoring equipment is calibrated and used properly by project personnel and is performance checked and utilized in accordance to the Operating Procedures and the manufacturer's instructions, and that results are properly recorded and filed (Attachment 4).

b. Verifies that project personnel have current Fit-For-Duty medical and training authorizations.

c. Maintains training certificates and Fit-For Duty Medical authorizations at the site for possible agency review.

d. Assumes any other duties as directed by the PM or PHSM.

e. Coordinates with the PHSM and the URS-Dames&Moore Occupational Medicine support to identify personnel for whom specific PPE or exposure monitoring may be required or desirable.

f. Conducts daily safety briefings and completes the Site Safety Briefing Report located in Attachment 5.

g. Assists BNL in the development of Work Permits and posts such permits prior to the start of field operations.

h. Provides ongoing review of the protection level needs as project work is performed, and informs the PM of the need to upgrade/downgrade protection levels as appropriate.

i. Maintains a daily log of personnel entry and exit, a record of personnel activities, monitoring performed, exposure results, radiological exposure results, and incidents.

j. Sees that decontamination procedures listed in Section 10, below are followed by project personnel.

k. Stops Work, if necessary, in the event of an emergency or to correct unsafe work practices.

l. Serves as the Project Local Emergency Coordinator (LEC) for the BNL Emergency Plan (see Section 11, below).

4.2.5 URS Lead Radiological Control Technician (LRCT). The URS and sub-contractor radiological control technicians supporting this project are assigned to the BNL Radiological Control Division and report to the BGRR-DP Facility Support Group. They will be under the direct supervision of the BGRR-DP Manager for ESH&Q. The initial Project staffing will consist of two Senior and one junior RCTs.

a. Shall be qualified by the BNL Radiological Control Division.

b. Conduct radiation monitoring as outlined in Section 6, below.

c. Ensure that all radiological monitoring equipment is calibrated in accordance with BNL requirements and all URS radiological instruments are issued via the Radiological Control Division Instrument and Calibration Group.

d. Assist BGRR-DP in developing Radiological Work Permits (Section 8.2, below), for approval by BGRR-DP FS Representative or FS Lead RCT, prior to the start of work in each work area where radioactive materials are present or presumed to be present.

e. Coordinate personal dosimeter monitoring with BNL facility support personnel. Ensure that all site personnel use personal dosimetry, and maintain accountability for all assigned devices and the records generated from use.

f. Ensure that the proper personal protective equipment is worn by site personnel, as indicated by the BNL Work Permit.

g. Assist with radiological monitoring for skin and inner clothing contamination after site personnel have performed PPE doffing procedures.

h. Implement engineering controls and ALARA principles (time, distance, and shielding techniques or contamination control strategies)

i. Document the occurrence of non-conformance, poor radiological performance, accidents, incidents or occurrences as described in Section 11.

j. Maintain accountability, in conformance with BNL RadCon Manual and institutional RadCon procedures, of all radioactive sources used to conduct performance checks for instruments, etc., and notify the PM and the BGRR Subcontractor Technical Representative in the event of any loss of radioactive material.

4.2.6 Project Personnel are responsible for:

a. Taking all reasonable precautions to prevent injury to themselves and to their fellow employees, including the authority to order "stop work" and to notify supervisors when conditions or operations appear to present imminent hazards, as per the BNL Stop Work Procedure.

b. Performing only those tasks they believe they can do safety, and immediately reporting any accidents and/or unsafe conditions to the safety personnel, operational supervisor or PM.

c. Implementing the procedures set forth in this ESHERP and the BNL SBMS, and reporting any deviations from these procedures to safety personnel, operational supervisor or PM.

d. Notifying the Corporate Occupational Physician of any special medical problems (i.e., medications that could affect job performance, allergies), and ensuring that information is considered by the physician in the determination of fitness discussed in Section 12.3, below.

e. Attending all required site safety briefings, participating in work planning discussions and evolution critiques, and adhering to the procedures specified in the site safety briefing.

f. Participating in the URS workplace substance abuse program, Section 8.5.

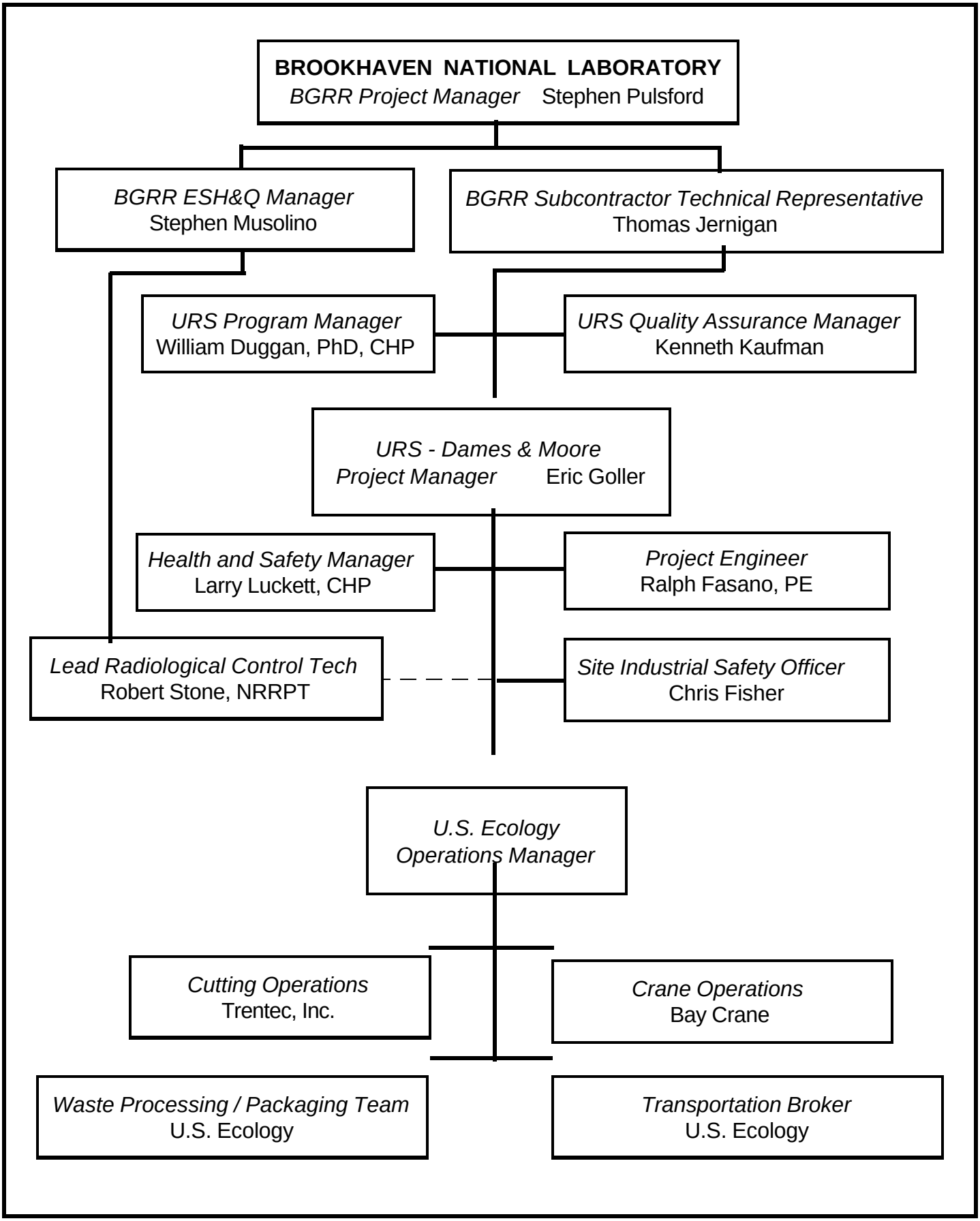
g. Reviewing this project ESHERP, BNL Work Permit(s) and signing the acceptance form(s).

4.2.7 URS Quality Assurance Manager

a. Develops specific procedures for ensuring reliable, reproducible and defensible data to support decisions.

b. Conducts and/or participates in surveillances and audits, to ensure compliance with ESHERP and Technical Work Documents.

Figure 1. URS-Dames & Moore Organization Chart



5.0 PROJECT HAZARD ANALYSIS

During the remediation work, BNL-BGRR-DP staff and the URS-Dames&Moore, U.S. Ecology and sub-contractor workers must effectively communicate and work as a team to minimize potential physical safety hazards, radiological hazards, and the chronic and acute health hazards present in the project operations and staging areas.

Prior to the establishment of the National Laboratory Facilities, the Brookhaven site was utilized as a U. S. Army training post. With this history in mind, site workers should be aware of the possible presence of unexploded ordnance when digging or excavating on the site. Personnel should be alert to the possibility that an unusual item might be unexploded ordinance and should stop work, evacuate the area, and notify supervisory personnel for assistance from BNL personnel trained in appropriate response.

5.1 Project Tasks and Operations

The Work Plans for the execution of the BGRR Above Ground Ducts Removal Project include a Duct Cutting and Segmentation Plan, a Critical Lifting Plan, a Waste Management Plan, and the Project QAPP. A review of these plans identifies several broad tasks that will likely be performed during the project execution. The tasks include the following:

- Task 01 Mobilization
- Task 02 Prepare for Concrete Duct and Column Cutting
- Task 03 Apply Contamination Controls to Duct Internals
- Task 04 Cutting Concrete Ducts and Support Columns
- Task 05 Breaking Containment and Sealing Concrete Cuts
- Task 06 Sampling, Surveys, and Packaging samples and secondary wastes
- Task 07 Lifting/Lowering Concrete sections from roof to ground level
- Task 08 Move/Load Concrete Pieces at ground level and onto trailers
- Task 09 Decontamination and Collapse Controls
- Task 10 Waste Shipment
- Task 11 Demobilization

Following waste processing on site at BNL, the duct sections will be transported to the US Ecology Nuclear Materials Management Center in Oak Ridge, TN for volume reduction, waste stream separation and waste disposition/disposal. The US Ecology facility is regulated and inspected by the State of Tennessee under Tennessee Radioactive Material License No. R-01037-B04, due to expire on February 29, 2004. Operations at the US Ecology facility are performed and managed under facility-specific procedures and conditions of the state license, and are beyond the scope of this BNL site-specific ESHERP.

The following portions of Section 5.1 address the individual tasks performed in execution of the BGRR Above Ground Ducts Removal Project and identify the hazards associated with each task. The hazards

and the appropriate preventive or corrective measures for each hazard are described in detail in Section 5.2 The hazards involved in each of the project tasks for the removal of the AGDs are identified in Table 4. The section of the ESHERP that addresses each hazard is identified in the Table to facilitate review of the appropriate information.

ES&H requirements for each task shall be implemented through the work planning documents attached to the BNL Work Permit. These documents shall be in the form of Temporary Procedures as per ERD-OPM 1.0.

Table 4. Project Specific Hazard Assessment Summary for Removal of Above Ground Ducts at the BGRR

Task Specific Potential Hazard	Project Stage or Task											Hazard Discussed in Section of Project ESHERP
	1	2	3	4	5	6	7	8	9	10	11	
	Mobilizatio	Prepare for	Apply Duct Internal	Cut	Break Containme	Sampling/S	Lower Duct	Move/Load	Collapse	Shipm	Demobilizat	
Heat/Cold Stress while wearing PPE		U	U	U	U	U	U		U			§ 5.2.1
Asbestos, Lead, PCBs Hazards – Passive Exposure	U	U			U	U	U	U	U	U		§ 5.2.2
Asbestos, Lead, PCBs Hazards – Surface contamination				U	U	U			U			§ 5.2.2
Asbestos, Lead, PCBs Hazards – Airborne				U	U				U			§ 5.2.2
Radiological Hazard - Exposure			U						U	U		§ 5.2.3
Radiological Hazard - Contamination			U	U	U	U	U	U	U			§ 5.2.3
Radiological Hazard - Airborne			U	U	U			U	U			§ 5.2.3
Loud Noise			U	U			U					§ 5.2.6.1
Slips, Trips and Falls	U		U		U		U	U	U	U	U	§ 5.2.6.2
Back Injuries due to improper lifting	U		U		U				U		U	§ 5.2.6.3
Falls from Height		U	U		U	U	U				U	§ 5.2.6.4
Working around utilities and electrical hazards	U			U	U						U	§ 5.2.7
Working Around Vehicles, Forklifts, and Heavy Equipment		U					U	U		U	U	§ 5.2.8
Confined Space Entry			U									§ 5.2.9
Cranes / Shifting Loads				U	U	U	U					§ 5.2.10
Diamond Wire Saw operations				U								§ 5.2.11
Fire hazards	U			U					U		U	§ 5.2.12
Applying contamination fixatives			U		U	U						§ 5.2.13

5.1.1 Task 01 Mobilization

5.1.1.1 Task description. Efforts by project personnel include:

- Individual site-specific training
- Site survey and develop RWP and Temporary Procedure
- Setting up work zones and site controls
- Lay-out and check-out equipment
- Build bracing, safety rails, and preliminary construction of containment (duct coating may not be disturbed until approval to commence duct removal activities has been received by BGRR Project Management.
- Perform Readiness Review in conjunction with BGRR-DP

5.1.1.2 Hazard Assessment. The performance of this task has the potential to expose the worker to the following hazards:

- Exposure to hazardous materials (asbestos, lead and PCBs) on the duct exterior
- Physical Hazards of slip, trips and falls in/around the worksite
- Physical Hazard of back injuries due to improper lifting in/around the worksite
- Working around utilities and electrical energy sources with hand tools
- Potential fire hazards due to sparks from cutting wood for building bracing, safety railing and preliminary containment.

5.1.2 Task 02 Prepare for Concrete Duct and Column Cutting

5.1.2.1 Task description. Efforts by project personnel include:

- measuring, marking and applying tape to duct exterior at the proposed cut point
- Installing the diamond wire around the duct/support
- securing rigging and lift supports around the section
- install cribbing and supports as necessary
- erecting the external duct containment, narrow, HEPA-filtered shroud around the duct circumference, enclosing the saw wire.
- For duct sections not over the roof, will require climbing scaffolding to reach cut point.
- Perform an operational readiness review, per BNL ES&H Standard 1.3.2.

NOTE: Moving the contaminated saw support stand to the proposed cut position is addressed in Task 05.

5.1.2.2 Hazard Assessment. The performance of this task has the potential to expose the worker to the following hazards:

- Heat / Cold Stress while wearing PPE

- C Exposure to hazardous materials (asbestos, lead and PCBs) on the duct exterior
- C Physical Hazard of back injuries due to improper lifting in/around the worksite
- C Potential falls from elevated work areas
- C Working around vehicles, forklifts and heavy equipment
- C Working around cranes and shifting loads

5.1.3 Task 03 Apply Contamination Controls to Duct Internals.

5.1.3.1 Task description. Efforts by project personnel include:

- C Entering duct to apply/spray a fixative to hold surface contamination in place.
- C Entering duct to attach internal duct containment, plastic liners on either side of proposed cut point, to contain cooling spray and slurry drip from the cutting wire.

5.1.3.2 Hazard Assessment. The performance of this task has the potential to expose the worker to the following hazards:

- C Heat / Cold Stress while wearing PPE
- C Radiological Hazards from materials in the duct interior
- C Physical Hazards of excessive noise
- C Physical Hazards of slip, trips and falls in/around the worksite
- C Physical Hazard of back injuries due to improper lifting in/around the worksite
- C Potential falls from elevated work areas
- C Confined Space Entry

NOTE: At this time the actual fixative to be used that is compatible with volume reduction and waste stream segregation processes at the US Ecology facility has not been determined. The hazards assessment of the fixative and its application will be addressed in the Job Safety Analysis performed to support the Temporary Procedure on this project task.

5.1.4 Task 04 Cutting Concrete Ducts and Support Columns

5.1.4.1 Task description. Efforts by project personnel include:

- C Operating saw remotely from out side the containment
- C entering the saw containment to adjust wire tension and pulleys, if required.
- C remote recycling of spray coolant collected inside saw containment
- C apply tension on the crane rigging to support cut section, as necessary.

5.1.4.2 Hazard Assessment. The performance of this task has the potential to expose the worker and the environment to the following hazards:

- C Heat / Cold Stress while wearing PPE

- C Exposure to hazardous materials (asbestos, lead and PCBs) on the duct exterior
- C Radiological Hazards from materials in the duct interior
- C Physical Hazards of excessive noise
- C Working around utilities and electrical energy sources
- C Working around cranes and shifting loads
- C Release of radioactivity to air or soil
- C Inherent hazards of saw operations and failure
- C Potential fire hazards due to sparks/hot wire from cutting apparatus

5.1.5 Task 05 Breaking Containment and Sealing Concrete Cut Surfaces

5.1.5.1 Task description. Following the completion of the cut, efforts by project personnel include:

- C Entering the saw containment to recover saw, collect the slurry and isolate saw enclosure from the duct external enclosure.
- C Collapse the duct external enclosure; wiping, absorbing excess and cleaning/fixing any contaminants on the cut surface.
- C Wrap exposed edge on the outgoing segment with 6 mil poly sheeting
- C using the crane or forklift to move the saw containment to the next cut position.
- C Seal/cover the roof openings resulting from duct cutting and removal

Note: Eight down-comer pipes will be cut to remove duct sections over the roof (Sections 9 through 4, 3N and 3S). The same day as the duct section removal, the cut surface will be cleaned of cutting debris, and external surface contamination will be fixed or removed. A commercial-grade asphalt-based roofing sealant (cold tar type) will be placed on the cut concrete surface around the duct/roof opening. The duct/roof openings will be covered using galvanized checkered steel plate (approx 1/4 inch or equivalent) cut to size and contour of the cut surface. The steel plate will be fastened to the concrete column or duct pedestal using anchor bolts, and the edges of the cover will be sealed with the roofing sealant.

5.1.5.2 Hazard Assessment. The performance of this task has the potential to expose the worker and the environment to the following hazards:

- C Heat / Cold Stress while wearing PPE
- C Exposure to hazardous materials (asbestos, lead and PCBs) on the duct exterior
- C Radiological Hazards from materials in the duct interior
- C Physical Hazards of slip, trips and falls in/around the worksite
- C Physical Hazard of back injuries due to improper lifting in/around the worksite
- C Potential falls from elevated work areas
- C Working around utilities and electrical energy sources
- C Working around cranes and shifting loads
- C Release of radioactivity to air or soil

5.1.6 Task 06 Sampling, Surveys, and Packaging samples / wastes.

5.1.6.1 Task description. In this task personnel will assemble samples, inventory final packages, label and survey packages and deliver to package pickup point.

5.1.6.2 Hazard Assessment. The performance of this task has the potential to expose the worker and the environment to the following hazards:

- Heat / Cold Stress while wearing PPE
- Exposure to hazardous materials (asbestos, lead and PCBs) on the duct exterior
- Radiological Hazards from materials in the duct interior
- Potential falls from elevated work areas
- Working around cranes and shifting loads
- Release of radioactivity to air or soil

5.1.7 Task 07 Lifting/Lowering Concrete from roof to ground level

5.1.7.1 Task description. Efforts by project personnel include:

- Inspecting rigging and loads
- Lifting cut segment and lowering to ground level on prepared cribbing.
- removing rigging from the concrete piece.

5.1.7.2 Hazard Assessment. The performance of this task has the potential to expose the worker and the environment to the following hazards:

- Heat / Cold Stress while wearing PPE
- Exposure to hazardous materials (asbestos, lead and PCBs)on the duct exterior
- Physical Hazards of excessive noise
- Physical Hazards of slip, trips and falls in/around the worksite
- Potential falls from elevated work areas
- Working around vehicles, forklifts and heavy equipment
- Working around cranes and shifting loads
- Release of radioactivity to air or soil

5.1.8 Task 08 Move/Load Concrete Pieces on ground and onto trailers

5.1.8.1 Task description. Once concrete pieces have ben lowered to ground level efforts by project personnel include:

- Using foklifts to move concrete sections from drop point to staging areas
- Using forklifts to move sections to the load point and place onto trailers for shipment

5.1.8.2 Hazard Assessment. The performance of this task has the potential to expose the worker and the environment to the following hazards:

- Physical Hazards of slip, trips and falls in/around the worksite
- Working around vehicles, forklifts and heavy equipment
- Release of radioactivity to air or soil

5.1.9 Task 09 Decontamination and Collapse Controls

5.1.9.1 Task description. At various points in the project, tools, equipment and vehicles will require decontamination before reuse or release from the exclusion zone. Decontamination may be performed in stages and may require use of equipment powered by electric generators and/or pressurized lines of air or liquid. Generated wastes will be collected and segregated.

5.1.9.2 Hazard Assessment. The performance of this task has the potential to expose the worker and the environment to the following hazards:

- Heat / Cold Stress while wearing PPE
- Exposure to hazardous materials (asbestos, lead and PCBs)on the duct exterior
- Radiological Hazards from materials in the duct interior
- Physical Hazards of slip, trips and falls in/around the worksite
- Physical Hazard of back injuries due to improper lifting in/around the worksite
- Release of radioactivity to air or soil
- Potential fire hazards due to sparks from cutting wood for demolishing bracing, safety railing and preliminary containment.

5.1.10 Task 10 Waste Shipment

5.1.10.1 Task description. Efforts by project personnel include:

- performing surveys on empty and trailers loaded with prepped concrete segments.
- preparing and labeling waste containers and concrete segments.

5.1.10.2 Hazard Assessment. The performance of this task has the potential to expose the worker to the following hazards:

- Exposure to hazardous materials (asbestos, lead and PCBs)on the duct exterior
- Radiological Hazards from materials in the duct interior
- Physical Hazards of slip, trips and falls in/around the worksite
- Working around vehicles, forklifts and heavy equipment

5.1.11 Task 11 Demobilization

5.1.11.1 Task description. Following completion of Project activities, the site and equipment will be place in a stand-down configuration and prepared for site release. Electrical equipment will be de-energized and locked-out; gasoline generators will be drained and stored; generated wastes will be packaged and staged in an area coordinated with BNL BGRR.

5.1.11.2 Hazard Assessment. The performance of this task has the potential to expose the worker to the following hazards:

- Physical Hazards of slip, trips and falls in/around the worksite
- Physical Hazard of back injuries due to improper lifting in/around the worksite
- Potential falls from elevated work areas
- Working around utilities and electrical energy sources
- Working around vehicles, forklifts and heavy equipment
- Potential fire hazards due to sparks from cutting wood for demolishing bracing, safety railing and preliminary containment

5.2 Hazard Analysis and Preventive/corrective Measures

5.2.1 Cold/Heat Stress Recognition and Control

Since site work is to be conducted during the summer, heat stress is a concern to the health and safety of personnel. In temperate periods, wearing PPE puts a worker at a considerable risk of developing heat stress. Table 5 describes the signs and symptoms of heat stress. Heat stress can result in health effects ranging from heat fatigue to serious illness or death. Consequently, regular monitoring and other precautions are vital.

Table 5. Signs and Symptoms of Heat Stress

Heat rash may result from continuous exposure to heat or humid air.

Heat cramps are caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include:

- Muscle spasms
- Pain in the hands, feet, and abdomen.

Heat exhaustion occurs from increased stress on various body organs, including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:

- Pale, cool, and moist skin
- Heavy sweating
- Dizziness, fainting, and nausea.

Heat stroke is the most serious form of heat stress when temperature regulation fails, and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury or death occurs. Competent medical help must be obtained. Signs and symptoms are:

- Red, hot, and unusually dry skin
- Lack of or reduced perspiration
- Dizziness and confusion
- Strong, rapid pulse and coma.

For workers wearing standard work clothes, recommendations for monitoring and work/rest schedules are provided in URS-Dames&Moore SMS No 18, Heat Stress. This procedure will be implemented for workers wearing semipermeable PPE or impermeable PPE when the temperature in the work area is above 70EF. Cooling devices/vests to aid natural body heat exchange during prolonged work or severe heat exposure will be available on site and will be used as determined by the SISO under the monitoring discussed above.

5.2.2 Chemical Hazards in the BGRR Above Ground Duct Removal

Personal protective equipment (PPE) appropriate to the hazard potential of waste components will be provided. PPE will consist of impermeable outer clothing and gloves that will intercept and preclude skin contact with the wastes. Respirators and/or supplied air will be provided at appropriate times for specific task exposures. The use of respirators will intercept and preclude inhalation and ingestion of waste vapors or airborne particulates. PPE and respirators are discussed in detail in Section 7, below. Site controls discussed in Section 8 and standard work practices discussed in Section 9, below, will also provide protection against exposures to hazardous chemicals in the workplace.

To address the problem of chemical hazards from species identified during the project, BNL will authorize URS-Dames&Moore to access chemical hazard databases on the BNL computer network. Access will be provided through BGRR-DP computer resources in the project Administrative Location. As the need

arises if new hazards are identified or suspected, BNL ES&H personnel and the databases will be queried to identify chemical characteristics, hazards and precautions. This information will be added to site documentation and presented in site safety briefings as appropriate.

When assessing occupational hazard levels, limits found in American Conference of Governmental Industrial Hygienists (ACGIH), "Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices" (most recent edition), will be applied when ACGIH Threshold Limit Values (TLVs) are lower (more protective) than Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs).

5.2.2.1 Lead. The levels of lead observed in samples of the exterior coating of the Above Grade Ducts were discussed in Section 3, above. Procedures for addressing the lead hazards are in the URS-Dames&Moore SMS No 22, *Lead in Construction*. This Procedure includes:

- Project personnel will receive lead awareness training on operations with materials containing lead.

- A site-specific "Lead Compliance Plan" will be developed with BGRR ESH&Q Manager for activities involving only the duct exteriors (such as sampling) and will be coordinated with RWP for activities that involve both interior and exterior surfaces (such as concrete cutting).
- Lead exposure will be part of the medical surveillance program, discussed in Section 12, below.
- Lead in the workplace will be monitored as described in section 6, below.
- Exposures to lead in the workplace will be controlled through the use of respirators and PPE, implemented through a Hazardous Work Permit developed with BGRR ESH&Q Manager.

Information below is extracted from a Public Health Statement by the US Agency for Toxic Substances and Disease Registry, June 1990.

5.2.2.1.1 Biological Effects of Lead.

Lead can enter your body when you breathe in air with lead-containing dust or particles of lead. Almost all of the lead in the lungs enters the blood and moves to other parts of the body. In adults, very little of the amount of lead swallowed in food, beverages, water, and dust or soil enters the blood from the gastrointestinal tract and moves to other parts of the body. Much less lead enters the body through the skin than through the lungs or gastrointestinal tract. Regardless of how lead enters your body, most of it is stored in bone. Because some lead is stored in the body each time you are exposed, the levels of lead in bone and teeth get higher as a person gets older. Lead that is not stored in the body is removed in the urine and feces.

The effects of lead once it is in the body are the same no matter how it enters the body. However, exposure to lead is especially dangerous for unborn children because their bodies can be harmed while they are being formed. If a pregnant woman is exposed to lead, it can be carried to the unborn child and cause premature birth, low birth weight, or even abortion.

The ability of lead to cause cancer in humans has not been shown. To date, workplace studies do not provide enough information to determine the risk of cancer for workers exposed to lead. However, tumors have developed in rats and mice given large doses of lead. The U.S. Department of Health and Human Services has determined that lead acetate and lead phosphate may reasonably be anticipated to be carcinogens.

Exposure to high levels of lead can cause the brain and kidneys of adults and children to be badly damaged. Lead exposure may increase blood pressure in middle-aged men. It is not known if lead increases blood pressure in women. Also, a couple may have trouble having children if the man is exposed to lead because high levels of lead may affect his sperm or damage other parts of the male reproductive system.

5.2.2.1.2 Lead characteristics and sources of exposure.

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead and its compounds can be found in all parts of the environment, for example, in plants and animals used for food, air, drinking water, rivers, lakes, oceans, dust, and soil. Lead in air can be carried long distances from where it is released. Lead in the air attaches to dust. The lead-containing dust is removed from the air by rain. Lead stays in soil for many years. However, heavy rain can cause lead-containing soil to move into water.

The burning of gasoline has been the single largest source (90%) of lead in the atmosphere since the 1920s. A lot less lead in the air comes from gasoline now because EPA reduced the amount of lead that can be used in gasoline. Less than 35% of the lead released to the air comes from gasoline.

Other sources of release to the air may include emissions from iron and steel production, smelting operations, municipal waste incinerators, and lead-acid-battery manufacturers. Cigarette smoke is a source of lead, so people who smoke tobacco or who breathe in tobacco smoke may be exposed to more lead than people who are not exposed to cigarette smoke.

The major sources of lead released to water are lead plumbing and solder in houses, schools, and public buildings; lead-containing dust and soil carried onto water by rain and wind; and wastewater from industries that use lead.

5.2.2.1.3 Lead Exposure Regulations.

The control of lead in construction projects is regulated by the OSHA Construction Industry Standard 29 CFR 1926.62. The OSHA standard limits an employee's occupational exposure to a Permissible Exposure Limit (PEL) of 0.05 mg/m^3 as an 8-hour time-weighted average (TWA) exposure. The ACGIH also limits an employee's exposure to elemental lead to a TLV of 0.05 mg/m^3 as an 8-hour TWA exposure. To limit the amount of lead people are exposed to in the air, EPA does not allow the amount of lead that the public breathes over 3 months to be more than 1.5 micrograms of lead per cubic meter of air (1.5 ug/m^3). The

National Institute for Occupational Safety and Health (NIOSH) recommends that workers not be exposed to levels of more than 0.1 mg/m^3 for up to 10 hours.

5.2.2.2 Asbestos. The levels of asbestos observed in samples of the exterior coating of the Above Grade Ducts were discussed in Section 3, above. Procedures for addressing the asbestos hazards are in the URS-Dames&Moore SMS No 8, *Asbestos Operations (Surveys and Abatement oversight).* This Procedure includes:

- Project personnel will receive asbestos awareness training on operations with asbestos containing materials.
- Asbestos exposure will be part of the medical surveillance program, discussed in Section 12, below.
- Asbestos in the workplace will be monitored as described in section 6, below.
- Exposures to asbestos in the workplace will be controlled through the use of respirators and PPE, and implemented through a Hazardous Work Permit developed with BGRR ESH&Q Manager.

Information below is extracted from a Public Health Statement by the US Agency for Toxic Substances and Disease Registry, June 1990.

5.2.2.2.1 Biological Effects of Asbestos. As asbestos fibers accumulate in the lungs, several types of diseases may occur. *Asbestosis* is a scarring of the lung tissue. This scarring impairs the elasticity of the lung and hampers its ability to exchange gases. This leads to inadequate oxygen intake to the blood. Asbestosis restricts breathing leading to decreased lung volume and increased resistance in the airways. It is a slowly progressive disease with a latency period of 15 to 30 years.

The next type of disease attributed to asbestos exposure is *Mesothelioma*. It is a cancer of the pleural lining. It is considered to be exclusively related to asbestos exposure. By the time it is diagnosed, it is almost always fatal. Similar to other asbestos related diseases, mesothelioma has a longer latency period of 30 to 40 years.

Lung cancer is a malignant tumor of the bronchi covering. The tumor grows through surrounding tissue, invading and often obstructing air passages. The time between exposure to asbestos and the occurrence of lung cancer is 20 to 30 years. It should be noted that there is a synergistic effect between smoking and asbestos exposure, which creates an extreme susceptibility to lung cancer.

5.2.2.2.2 Asbestos Characteristics. Because asbestos fibers are naturally occurring and extremely aerodynamic, virtually everyone is exposed to asbestos. To be a significant health concern, asbestos fibers must be inhaled at high concentrations over an extended period of time. Asbestos fibers then accumulate in the lungs. As exposure increases, the risk of disease also increases. Therefore, measures to minimize exposure and consequently minimize accumulation of fibers will reduce the risk of adverse health effects.

Asbestos is only dangerous if it becomes airborne. As long as asbestos containing materials are not damaged, the asbestos fibers do not become airborne and do not pose a health threat to the building occupants or the worker.

5.2.2.2.3 Asbestos Exposure Regulations. Asbestos is known to be hazardous based on studies of high levels of exposure to asbestos workers and laboratory animals. However, the risks associated with lowlevel, non-occupational exposure are not well established. Therefore, the Environmental Protection Agency (EPA) concludes that there is no safe level of exposure to asbestos fibers. On the other hand, the Occupational Safety and Health Administration (OSHA) has set a Permissible Exposure Limit (PEL) at 0.1 fibers per cubic centimeter (f/cc) for an 8 hour time weighted average. The ACGIH limits an employee's exposure to airborne asbestos fibers to a TLV of 0.1 f/cc as an 8-hour time-weighted average exposure.

5.2.2.3 Poly-Chlorinated Biphenyl (PCB). The levels of PCB observed in samples of the exterior coating of the Above Grade Ducts were discussed in Section 3, above. PCBs are in the exterior coating of the Above Grade Ducts and are associated with the lead and asbestos also present in layers of the exterior coating. Safety procedures for exposure to lead and asbestos will also be protective for exposures to PCBs.

- Project personnel will receive hazard awareness training on operations with materials containing PCBs.
- PCB exposure will be part of the medical surveillance program, discussed in Section 12, below.
- PCB in the workplace will be monitored as described in section 6, below.
- Exposures to PCB in the workplace will be controlled through the use of respirators and PPE, and implemented through a Hazardous Work Permit developed with BGRR ESH&Q Manager.

5.2.2.3.1 Biological Effects of PCB. This compound is toxic by ingestion, inhalation and skin absorption. It is a strong irritant of the skin. It is also an irritant of the eyes, nose and throat. When heated to decomposition it emits toxic fumes of carbon monoxide, carbon dioxide, dioxins, and hydrogen chloride gas.

Symptoms of skin exposure to this compound may include chloracne, pigmentation of the skin and nails, swelling of the eyelids and distinctive hair follicles. Other symptoms may include irritation of the skin, eyes, nose and throat, conjunctivitis, hepatotoxicity, gastrointestinal disturbances, visual disturbances, dermatitis, numbness of the extremities, paresthesia and respiratory disturbances.

5.2.2.3.2 PCB Characteristics. This compound is used in electrical capacitors, electrical transformers, vacuum pumps, gas-transmission turbines, high-temperature dielectrics for electric wires and electrical equipment, heat-exchange fluids, coatings, inks, insecticides, fillers, adhesives, paints and in duplicating papers. It is also used as a plasticizer for cellulosics, vinyl resins and chlorinated rubbers. Formerly used as hydraulic fluids, fire retardants, wax extenders, dedusting agents, pesticide extenders, lubricants, cutting oils, sealants and caulking compounds.

5.2.2.3.3 PCB Exposure Level Regulations.

The Occupational Safety and Health Administration (OSHA) has set a Permissible Exposure Limit (PEL) at 0.5 milligram per cubic meter (mg/m^3) for an 8 hour time weighted average. The ACGIH limits an employee's exposure to chlorodiphenyls (i.e., PCBs) to two TLV for an 8-hour time-weighted average (TWA) exposure based on the concentration of chlorine. These levels are

- Chlorodiphenyl (42% chlorine) - 1.0 mg/m^3, and
- Chlorodiphenyl (54% chlorine) - 0.5 mg/m^3.

5.2.3 Radiological Health Hazards.

The goal of minimizing any ionizing radiation hazard to project personnel working at the BNL site will be governed by an ALARA (As Low As Reasonably Achievable) policy. To achieve this goal, a clear understanding of the characteristics and effects of ionizing radiation should be attained by all project personnel. Individuals will attend the site-specific radiation safety training identified in Section 13.4, below. The following subsections review explanations of the different types of radiation, their effects, and methods for reducing the hazards. This information is provided to reinforce individual training provided. In addition, a summary of the radionuclides that may be encountered during project activities is presented.

5.2.3.1 Project-specific Radiation Hazards and Controls. The levels of radioactivity and the radiation dose-rates in the vicinity of the Above Grade Ducts were discussed in Section 3, above. Major radionuclides identified in the ducts include:

Radionuclide	Principle Radiations	Radionuclide	Principle Radiations
^{60}Co	â, ã	^{90}Sr	â
^{137}Cs	â, ã	^{90}Y	â
^{152}Eu, ^{154}Eu	â, ã	^{238}Pu, ^{239}Pu, ^{240}Pu	á, â
^{241}Am	á, ã	^{233}U, ^{234}U, ^{235}U, ^{238}U	á, â, ã

The work locations, the areas adjacent to waste storage containers, and the waste staging locations will have measurable radiation exposure, and in some instances significant radiation contamination potential.

Project personnel will receive site-specific training on radiological operations, as discussed in Section 13, below. Radiation monitoring devices, as discussed in Section 6, below, will be available, and their use is required. A Radiological Work Permit, as described in Section 8.2, below, will be developed for each phase of the project to provide specific radiological and safety controls and to implement the project ALARA policy and goals.

5.2.3.2 Biological Effects of Ionizing Radiation. The harmful consequences of ionizing radiations to a living organism result from the energy absorbed by cells and tissues of the organism. The absorbed energy causes ionization and excitation of atoms within the tissue. This leads to a direct damage to genes present in cellular nuclei or indirect chemical damage via formation of breakdown products. If a sufficient amount of damage occurs, the living cells will die, thus resulting in tissue damage. If enough tissue is damaged in a short time, physical symptoms such as nausea, vomiting, and malaise could occur (short term effects). However, a large amount of dose would have to be absorbed before these symptoms occurred (over 100 rem). At much lower doses, long term effects of radiation may include either somatic effects (e.g., cancer, cataracts, lifespan shortening), and genetic effects (changes to chromosomes in sex cells) which could affect future generations.

5.2.3.3 Radiation Characteristics. Radionuclides emit energy (radiation) as they undergo spontaneous radioactive decay. The forms of emitted energy are characteristic of the decay process and include energetic charged particles (alpha and beta particles) and/or photons (gamma rays and x-rays).

Alpha particles are identical to the nucleus of helium atoms ejected from the nucleus of some radioactive elements and carry an electrostatic charge of plus two. These particles have low penetrating ability and have maximum ranges in air and in tissue of approximately 5.1 centimeters and 70 microns, respectively. They generally cannot penetrate the outer dead layers of the skin and thus are not regarded as an external radiation hazard. With regard to an internal hazard, inhaled or ingested alpha emitters can produce dense ionization tracks in the biological material that they traverse and damage biological tissue. Since fluids in the GI tract provide greater shielding than gases in the lung, and alpha emitting radionuclides deposited in the lung are more readily absorbed into blood and reach internal organs, inhalation is of greater concern than ingestion.

Beta particles are electrons or positrons emitted from a nucleus during radioactive decay. They transfer much less energy and cause less biological damage than that of alpha particles, but their penetration power in material is greater than that of alpha particles with a range of generally less than 6.1 meters in air and 8 millimeters in tissue. Due to the moderate penetrating ability, both internal and external exposures should be considered.

Gamma radiation and ***x-rays*** are electromagnetic radiation and are distinguishable from beta particles by their greater penetrating power in material. Other than their origin from the nucleus of the atom, gamma rays are indistinguishable from x-rays for radiation protection purposes and can be simply referred to as external penetrating radiation. Such radiation from radionuclides external to a body can penetrate the body, transferring the energy and thereby harming internal organs. They may also be ingested or inhaled, and irradiate the body from within. Due to their great penetrating ability, both internal and external exposures should be considered.

5.2.3.4 Radiation Exposure Levels from Wastes and Samples. During prior sampling activities at the AGD, similar to the work proposed in this project, BGRR has measured the radiation exposure rates in

the vicinity of the ducts and samples. These measurements indicate that samples may potentially have significant radiation levels in their vicinity. A summary of previous survey data is provided in Section 3.

5.2.3.5 Radiation Protection Regulations and Guidelines. Personal dosimetry, airborne monitoring, bioassay, whole-body counting, and other types of radiation monitoring (i.e., use of a hand-held meters with response appropriate to the expected radiation hazard) will be used to determine radiation dosage and exposure levels. The use of these measures will be governed by procedures in the Work Plan and properly determined by the PHSM or the PM. Department of Energy, Federal and state rules define the allowable doses which can be received by members of the public and by radiation workers. Table 6 summarizes the annual dose limits mandated by the Department of Energy.

Federal and state guidelines also mandate contamination limits for personnel, equipment, and facilities. Personnel and equipment will be monitored for radiological contamination through the use of hand-held radiological detection equipment upon exiting Radiological Contamination Control Areas, at the direction of the Radiological Work Permit. The radiological contamination monitoring issues, including, but not limited to, instrument selection, wipe sample frequency, the collection of personal air samples, exit monitoring, and buffer zone setup will be decided by the LRCT and the BNL RCD facility support on a project or task-specific basis. Table 14 in Section 10 below, summarizes the allowable contamination limits for release of equipment. The limits will be adhered to unless superseded by the BNL Rad Con Manual or by task specific procedures approved by BGRR.

Task specific planning will be performed keeping in mind the goals of the ALARA Policy and using the principles of time, distance, shielding, and dress (PPE) to minimize exposure to radiation and prevent inhalation or skin contact with radioactive materials. Tasks that may result in a deviation from ALARA policy must receive approval from the PM before work commences. The project personnel shall use the BGRR-DP Administrative Control Level for an individual dose (100 mrem).

Table 6. Summary of Dose Limits [10CFR835.202, 1003(a)]

Exposures shall be well below the limits in this Table and maintained as low as reasonably achievable. The Administrative Control Levels for limiting exposure are described in Article 212.

Type of Exposure	**Annual Limit**
Radiological Worker*: Whole Body (internal + external)	5 rem[1]
Radiological Worker: Lens of Eye	15 rem[3]
Radiological Worker: Extremity (hands and arms below the elbow; feet and legs below the knees) and skin**	50 rem[4]
Radiological Worker: Any organ or tissue (other than lens of eye)	50 rem[2]
Declared Pregnant Worker: Embryo/Fetus	0.5 rem per gestation period
Minors and Students (under age 18): Whole body (internal +external)	0.1 rem[1]
Visitors*** and public: Whole Body (internal + external)	0.1 rem[1]

* Radiological Workers are General Employees authorized unescorted access to radiological areas per Articles 332, 334, and 335.

** See Appendix 2C for guidance on non-uniform exposure of the skin.

*** Applies to guests who have not completed training in accordance with Article 611 and to personnel with occupational exposures at DOE facilities who have not submitted a current year dose record to the Radiological Control Division.

1.Total effective dose equivalent.
2.Sum of deep dose equivalent for external exposure and committed dose equivalent.
3.Dose equivalent.
4.Shallow dose equivalent.

NOTE: This is a copy of Table 2-1, BNL RadCon Manual. Mention of Articles and Appendices refers to the BNL RadCon Manual, which is available for review on the web-based Standards Based Management System.

5.2.4 Biological Hazards

5.2.4.1 Lyme disease/Tick-borne diseases. The BNL area in Eastern Long Island is an area where tick-borne Lyme Disease is widespread. While it is unlikely that ticks will be encountered in the paved work areas or on the roof, other areas of the site (tall grasses and woods, recreation areas, etc) are suspect. Light colored or white clothing should be worn to facilitate the visualization of ticks. Insecticide sprays for bodily application containing <30% DEET should be used. If the skin is punctured by a suspected tick bite, personnel should report the incident to the site supervisor and/or seek medical assistance at the Brookhaven Occupational Medicine Clinic. Additional information on the hazards, symptoms and prevention of Lyme Disease is provided in Table 7.

5.2.4.2 Spiders, Insect bites and stings. Field personnel should exercise caution when lifting covers off manholes or sumps, when removing ground or stockpile covers, or when disturbing wood, rock, or brush piles, etc., since insects and spiders are typically found in these areas. Spiders in the United States are generally harmless, with two notable exceptions: the Black Widow spider (Latrodectus Mactans) and the Brown Recluse or violin spider (Lox Osceles Reclusa). The symptoms of such a spider bite are: slight local reaction, severe pain produced by nerve toxin, profuse sweating, nausea, painful cramps in abdominal muscles, and difficulty in breathing and speaking. Victims recover in almost all cases, but an occasional death is reported. The bite of a Black Widow spider is the more painful and often the more deadly of the two.

General first aid for poisonous insect bites includes:

1. Minor Bites and Stings
   - ! Cold applications.
   - ! Soothing lotions, such as calamine.

2. Severe Reactions
   - ! Give artificial respiration if indicated.
   - ! Apply a constricting band above the injection site on the victim's arm or leg (between the site and the heart). Do not apply tightly. You should be able to slip your index finger under the band when it is in place.
   - ! Keep the affected part down, below the level of the victim's heart.
   - ! If medical care is readily available, leave the band in place; otherwise, remove it after 30 minutes.
   - ! Apply ice contained in a towel or plastic bag, or cold cloths, to the site of the sting or bite.
   - ! Give home medicine, such as aspirin, for pain.
   - ! If the victim has a history of allergic reactions to insect bites or is subject to attacks of hay fever or asthma, or if he or she is not promptly relieved of symptoms, call a physician or take the victim immediately to the nearest location where medical treatment is available. In a highly sensitive person, do not wait for symptoms to appear, since delay can be fatal.
   - ! In case of a bee sting, remove and discard the stinging apparatus and venom sac.

Table 7. Tick-borne Diseases

Lyme Disease. Lyme disease is an illness caused by a bacterium which may be transmitted by the bite of a tick (Ixodes Dammini), commonly referred to as the "Deer Tick." The tick is about the size of a sesame seed, as distinguished from the Dog Tick, which is significantly larger. The Deer Tick is principally found along the Atlantic coast, living in grassy and wooded areas, and feeds on mammals such as mice, shrews, birds, raccoons, opossums, deer, and humans. Not all ticks are infected with the bacterium, however. When an infected tick bites, the bacterium is passed into the bloodstream of the host, where it multiplies. The various stages and symptoms of the disease are well recognized and, if detected early, can be treated with antibiotics.

Removal of ticks is best accomplished using small tweezers. Do not squeeze the tick's body. Grasp it where the mouth parts enter the skin and tug gently, but not firmly, until it releases its hold on the skin. Save the tick in a jar labeled with the date, body location of the bite, and the place where it may have been acquired. Wipe the bite thoroughly with an antiseptic and seek medical attention as soon as possible.

The illness typically occurs in the summer and is characterized by a slowly expanding red rash, which develops a few days to a few weeks after the bite of an infected tick. This may be accompanied by flu-like symptoms along with headache, stiff neck, fever, muscle aches, and/or general malaise. At this stage treatment by a physician is usually effective; but, if left alone, these early symptoms may disappear and more serious problems may follow. The most common late symptom of the untreated disease is arthritis. Other problems which may occur include meningitis and neurological and cardiac abnormalities. It is important to note that some people do not get the characteristic rash but progress directly to the later manifestations. Treatment of later symptoms is more difficult than early symptoms and is not always successful.

When in an area suspected of harboring ticks (grassy, bushy, or woodland area) the following precautions can minimize the chances of being bitten by a tick:

1. Wear long pants and long-sleeved shirts that fit tightly at the ankles and wrists.
2. Wear light colored clothing so ticks can be easily spotted.
3. Wearing tick repellents may be useful.
4. Inspect clothing frequently while in tick habitat.

5.2.4.3 Poisonous plants. The majority of skin reactions following contact with offending plants are allergic in nature and are characterized by general symptoms of headache and fever, itching, redness, and a rash.

Some of the most common and most severe allergic reactions result from contact with plants of the Poison Ivy group including Poison Oak and Poison Sumac. The most distinctive features of Poison Ivy and Poison Oak are their leaves, which are composed of three leaflets each. Both plants also have greenish-white flowers and berries that grow in clusters. Such plants produce a severe rash characterized by redness, blisters, swelling, and intense burning and itching. The victim can also develop a high fever and become very ill. Ordinarily, the rash begins within a few hours after exposure, but it may be delayed for 24 to 48 hours.

First Aid Procedure

- Remove contaminated clothing.
- Wash all exposed areas thoroughly with soap and water, followed by rubbing alcohol.
- Apply calamine or other soothing skin lotion if the rash is mild.
- Seek medical advice if a severe reaction occurs, or if there is a known history of previous sensitivity.

5.2.5 Hazard Communication

The URS-Dames&Moore Hazard Communication Program is described in SMS No 2 , *Worker Right-to-Know (Hazard Communication)*, which complies with the OSHA Hazard Communication Standard (HCS) found in 29 CFR 1910.1200 and 29 CFR 1926.59. This standard applies to any chemical present in the workplace in such a manner that employees may be exposed under normal conditions of use or in a foreseeable emergency. Although waste materials are excluded from the OSHA requirement, decontamination chemicals for sampling apparatus or protective clothing (such as acetone or trisodium phosphate) and calibration standards (such as isobutylene gas) require Material Safety Data Sheets (MSDS) or hazards analysis.

The principle of communicating the hazards of materials used in the workplace to employees includes:

- All containers of hazardous chemicals must be appropriately labeled or tagged to identify the hazard and provide information on effects and appropriate protective measures.
- Labels, tags, or signs must be properly affixed and visible at all times while a hazard is present and removed promptly when the hazard no longer exists.
- Appropriate MSDS or hazards assessments will be available to any employees or subcontractor employees working in URS-Dames&Moore offices or laboratories or at construction, excavation, or other sites under URS-Dames&Moore's control. Information will be available through the BNL MSDS database (see section 5.2.2 above) and will be maintained in the Administrative Location with the project files. MSDS are required for neat chemicals used onsite, such as gasoline in portable generators or diesel dispensed for heavy equipment operation.

5.2.6 Physical Hazards

5.2.6.1 Excessive noise levels. Primary noise hazard at this site is from the concrete cutting equipment, internal combustion engines and generators and liquid pumps. Control measures for exposures to excessive sound levels are provided in Dames&Moore SMS No 26, *Noise and Hearing Conservation*. The major points of the program include:

- A sound meter capable of reading on the A-weighted scale (dBA) will be used onsite in situations where noise levels approach the action level. This meter will be used as an initial check when operations are begun using noise-producing equipment (e.g., gasoline-powered generator), and for periodic evaluation, thereafter.
- When continuous and impact noise levels may exceed 85 dBA, personnel in the vicinity of operating equipment will wear hearing protection (aural inserts or muffs) until data is available that indicates hearing protection is not necessary.
- Personnel will wash their hands prior to inserting ear plugs to avoid initiating ear infections.
- A rule of thumb is, if it is necessary to raise one's voice to be heard by another person when standing three feet apart, then hearing protection is required.

5.2.6.2 Slip-trip-fall accidents. Physical hazards such as slips, trips, and falls may occur, especially when vision and mobility is restricted due to PPE. Workers must walk cautiously at a site to avoid tripping, especially when uneven terrain is present. On slippery or wet surfaces, consider rubber-bottomed shoe covers and additional hand-hold support.

As with any construction-type project, uneven work surfaces and other slipping and/or tripping hazards may be present. Proper site housekeeping and removal of trash and debris will reduce slipping and tripping hazards. Proper site housekeeping will be the responsibility of all site personnel, and the SISO will make regular entries into the health and safety logbook at day's end, indicating the work area is adequately clean prior to worker dismissal. Employees will be made aware of the potential hazards onsite at the Morning Tailgate Safety Meeting

Falls are more serious when they occur from heights, see section 5.2.6.4, below.

5.2.6.3 Back injuries due to improper lifting. Accidents in manual handling of materials are primarily the result of unsafe working habits--improper lifting, carrying too heavy a load, incorrect gripping, or failing to wear personal protective equipment. These may be avoided by testing the weight of an object before attempting to lift and carry it. If it is too heavy (e.g. greater than 40 lbs), get help, and if possible, use mechanical lifting aids. Guidance on proper lifting is provided in URS-Dames&Moore SMS No 45, *Back Injury Prevention.*

Back injuries are among the leading occupational injuries reported by industrial workers. Back injuries such as pulls and disc impairments can be reduced by using proper manual lifting techniques. Leg muscles are stronger than back muscles, so workers should lift with their legs and not with their back. Proper manual lifting techniques include the following steps: The proper method for lifting to avoid injury is:

- Get a good footing.
- Place feet about shoulder width apart.
- Bend knees to pick up load. Never bend from waist.
- Keep back straight.
- Get a firm hold. Grasp opposite corners of the load, if possible.
- Keep the back as upright as possible.
- Lift gradually by straightening the legs--don't jerk the load.
- Keep the weight as close to the body as possible.
- When changing directions, turn the entire body, including the feet.
- Don't twist the body.

5.2.6.4 Falls from Elevated Work Areas. The removal of the AGD from over and adjacent to Building 704 will require personnel to work at heights above six (6) feet, presenting the hazard of falls from elevated locations. Extra precautions must be taken when guardrails or railings are absent or when ladders are used for access to a high place.

- Each employee will be provided training in fall hazard recognition by the SISO.
- A fall protection procedure is described in URS-Dames&Moore SMS No 40, *Fall Protection*, and will be implemented for general workers on the roof of Building 704, for personnel accessing the upper duct exterior during containment erection and collapse, and for setting the diamond saw wire and guides.
- Access to the duct exterior will be facilitated at some portions along the length by the erection of scaffolding to support duct sections, equipment and personnel. URS-Dames&Moore SMS No 31, *Scaffolding*, provides procedures for ensuring the integrity of scaffolding.
- URS-Dames&Moore SMS No 28, *Portable Ladders*, provides procedures ensuring the safe use of portable ladders to access elevated locations.

5.2.7 Electrical Utilities and Equipment Hazards

Electricity can shock, burn, and cause death. Overhead and underground utilities will be located, noted, and emphasized on all excavations and other digging/boring location plans and assignment sheets. When overhead electrical power lines exist at or near a work site, all wires should be considered energized and potentially dangerous. Safety precautions are provided in URS-Dames&Moore SMS No. 16, *Hand Tools and Portable Equipment*.

5.2.7.1 Underground and Overhead Utilities. A check will be made for low-hanging or sagging power lines before the site is entered. Power lines should not be lifted to gain entrance. BNL BGRR

Subcontractor Technical Representative will be contacted and a request shall be made to lift or raise and cut off power to the lines.

The existence of underground utilities, such as electric power, gas, petroleum, telephone, sewer, and water lines, should always be suspected. These underground electric lines are as dangerous as overhead lines. If a sign warning of underground utilities is located on a site boundary, it should not be assumed that underground utilities are located on or near the boundary or property line under the sign; they may be a considerable distance from the sign. BNL Plant Engineering or the utility company will be contacted before digging, driving stakes or emplacement of crane outriggers that may impact subsurface utilities.

5.2.7.2 Energized Equipment Hazards. All electric hand tools will have Ground Fault Interrupt wiring. All mechanical equipment will have guards in place during operations.

5.2.7.3 Lockout/Tagout Precautions. The SISO is responsible for identifying to BNL any equipment or systems requiring lockout/tagout (LO/TO) protection when specific pieces of equipment are brought onto the work site. BNL is the LO/TO authority for the project, and LO/TO will be accomplished under BNL ES&H Standard 1.5.1, Lockout/Tagout Requirements, Rev 2, March 1999. At that time, LO/TO procedures specific to the equipment will be developed with BNL, and the SISO will cover the requirements with project personnel in safety briefings.

Lockout/tagout is required during activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining or servicing equipment connected to an energy source such as electricity, pressure or steam. These activities include lubrication, unjamming equipment, or changes where an employee may be exposed to unexpected startup. A lockout/tagout procedure is not necessary for routine operations of a mechanized device. For the AGD Removal Project, a LO/TO procedure may be required for the diamond wire saw or for coolant recirculating pumps. Where applicable, it shall be cited in the Temporary Procedure.

- All personnel must comply with lockout/tagout requirements and site managers and the SISO must enforce the use of locks/tags to ensure protection where unexpected energization may occur.
- Individual locks/tags shall be applied and removed by each person exposed to the unexpected release of energy.
- When equipment is lockable, use of a lock is required by all exposed personnel. Where equipment is not lockable, tagout application or special lockout/tagout procedures shall be used as specified by the SISO and BNL.

5.2.7.4 Lockout/Tagout Responsibilities. All personnel are responsible for complying with the provisions of the lockout/tagout. Affected personnel shall be made aware of lockout/tagout procedures used to guard against unexpected startups.

Only individuals authorized under BNL ES&H Standard 1.5.1 shall operate energy isolating devices and place locks/tags on controls to prevent unexpected startups. Other employees who work in the area where lockout/tagout procedures are used shall be instructed about their purpose and prohibited from attempting to restart machines or equipment which are locked or tagged out.

5.2.8 Safety around vehicles and heavy equipment. Workers can be struck by mechanized vehicles used at a site. All personnel will be informed as to the traffic plan for equipment. While driving in reverse, the operator usually has a more limited field of view than while driving forward and must observe extra caution. Such vehicles must be equipped with a backup alarm distinguishable from the surrounding noise level to warn workers that the vehicles are moving in reverse. No one shall pass within 25 ft. in back of an occupied vehicle. Under no circumstances shall workers enter active equipment areas without notification of the operators and the ability to access the area safely. Active equipment areas and traffic will be discussed during daily tailgate/toolbox meetings.

Equipment that is operated on loading or waste areas must be equipped with an automatic backup alarm. Additionally, when employees are on foot or otherwise endangered by equipment in dumping or waste areas, a competent signalman should be used to direct traffic. The signalman must have no other assignment that interferes with signaling duties. If the equipment or truck cab is not shielded, the operator should stand clear of the vehicle during loading. Excavating or hoisting equipment should not be allowed to raise, lower, or swing loads over workers unless effective overhead protection is provided.

Powered industrial trucks can have different kinds of power sources and means of engaging a load. They can have battery-powered motors or engines using gasoline, diesel fuel, or LP gas. The load engagers can be the usual forks or can be scoops, arms, or manipulators for grasping boxes or drums from the sides. Some trucks can be equipped with a guarded platform that can be used to elevate a worker. The trucks are controlled either by a riding operator or a walking operator. With a walking operator, the truck is in effect a motorized hand truck.

General requirements for powered industrial trucks, machinery and vehicles are:

- Inspection of cranes and contractor provided equipment will be coordinated with the BGRR Subcontractor Technical Representative. Cranes shall be inspected by BNL prior to being brought on to the BNL site.
- Equipment must be examined daily before being placed into service to detect safety violations. A daily equipment checklist form is included in URS-Dames&Moore SMS No 19, *Heavy Equipment Operations,* and must be completed by equipment and vehicle operators on a daily basis.
- High-lift rider trucks must be fitted with an overhead guard to protect the operator from falling objects.
- If the load being carried obstructs forward view, the unit must travel with the load trailing.

- When a unit is left unattended (the operator is 25 feet or more away or the unit is not in view), the load must be fully lowered, the control lever positioned in neutral, the power shut off, and the brakes set. The wheels must be blocked if parked on an incline.
- Trucks, trailers, or railroad cars being unloaded or loaded with lift trucks must be secured by setting their brakes and placing wheel chocks under their rear wheels. Portable docks boards must be secured in position with devices which will prevent their slipping during loading and unloading.

Equipment powered by internal combustion engines can be a problem in enclosed areas because of the possible accumulation of carbon monoxide from the exhaust. Because this project will be performed out-of-doors, build-up of exhaust fumes is not anticipated to be a problem. Vehicles engines should not be idled in the vicinity of air supply intakes.

Since gasoline and LP gas are very flammable, they must be handled safely. A dedicated location for on-site storage of flammable liquids and fuel supplies will be coordinated with the BNL Fire/Rescue Group. Any driver operated equipment (truck, tractor) used on a site with uneven terrain must have some form of rollover protection.

5.2.9 Confined Spaces. As defined in the OSHA regulations, 29 CFR 1910.146, and the BNL ES&H Standards Manual (Standard 2.2.4, revision 4, April, 1995), a **confined space** is a workplace

- large enough and so configured that an employee can bodily enter and perform assigned work; and
- with a limited or restricted means of entry or exit; and
- which is not intended for continuous employee occupancy.

Examples of a confined space include, but are not limited to: storage tanks, process vessels, bins or other tank-like compartments usually having only a manhole for entry; underground tanks, pipelines and tunnels (ducts); and open-topped spaces more than four feet deep, such as pits or vaults having inadequate natural ventilation.

5.2.9.1 Class 1 Confined Space. Each open end of the cut duct providing access to the duct interior will be managed as a ***Class 1 Confined Space*** in accordance with BNL Standard 2.2.4. A *Class 1 Confined Space* means a confined space that does not contain or, with respect to atmospheric or physical hazards, have the potential to contain any hazard capable of causing death or serious physical harm. As a Class 1 Confined Space, entry into the duct from an open end does not require a permit-access control system, as long as the following procedures are performed:

a. Before an employee enters the space, the internal atmosphere shall be tested, with a calibrated direct-reading instrument, for the following conditions in the order given:
   {1} Oxygen content,
   {2} Flammable gases and vapors, and
   {3} Potential toxic air contaminants.

b. If a hazardous atmosphere is detected during entry:
   {1} Each employee shall leave the space immediately;

{2} The space shall be evaluated to determine how the hazardous atmosphere developed; and

{3} Measures shall be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place.

c. If work in the space is interrupted, the measurements must be performed again before work is resumed.

d. The SISO shall verify that the space is safe for entry and that these pre-entry measurements have been taken, through a written certification that contains the date, the location of the space, and the signature of the person providing the certification. The certification shall be made before entry and shall be made available to each employee entering the space.

5.2.9.2 Class 2 Confined Space. The duct interior prior to a cut and segment removal would be *Class 2 Confined Space* in accordance with BNL Standard 2.2.4. *Class 2 confined spaces* have one or more of the following characteristics

- Contains or has a potential to contain a hazardous atmosphere;
- Contains a material that has the potential for engulfing an entrant;
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
- Contains any other recognized serious safety or health hazard.

Class 2 Confined Space entry requires additional evaluations, special training and permit access control.

When during the project, access to the duct interior is anticipated prior to an end being cut and exposed, work will be planned in order to implement appropriate permit-access, confined space procedures in accordance with BNL Standard 2.2.4. Work in the confined spaces will not be initiated until adequate review and approval by URS-Dames&Moore and BNL officials.

Personnel in this project must be aware of confined spaces, and notify BNL Facility Support personnel for personnel adequately trained in confined space entry procedures before entering a confined space.

5.2.10 Cranes and Suspended Loads. Crane and lift operations are addressed in a separate project Rigging and Lifting Plan. Crane operations, rigging and lifting will be performed in conformance with BNL Procedures ESH 1.6.0 and 1.6.1. Guidance is also available in the DOE Standard No. DOE-STD-1090-96, rev 1, *Hoisting and Rigging (Formerly Hoisting and Rigging Manual)*, September 1996. Daily crane inspection forms, wire rope/rigging inspection forms, and safe work practices are provided in URS-Dames&Moore SMS No. 38, *Cranes*. Highlighted procedures for worker safety include:

- Always barricade to the extent of the swing radius of the boom,
- Never allow personnel under the load, or swing the boom over occupied areas,
- Sound the horn when swinging loads,
- Provide a ground guide to observe clearances when the operator's visibility is obscured, and
- Do not allow people to ride the hook, ball, load block or load.

5.2.11 Diamond Wire Saw and Saw Operations.

A diamond wire saw (DWS) will be used in concrete cutting operations. The DWS consists of a diamond matrix wire made to length for each individual cut and a hydraulic drive system that places the electrical components remote from the mechanical saw. Details of the DWS are provided at the sub-contractor's website [http://www.trentec.com]. The sawzall will be used to cut through the ductwork expansion joints. Other power and hand saws may be used in construction of containment and bracings.

Hazards associated with the use of the DWS include:

- Exposure to noise levels in excess of the PEL.
- Cuts and lacerations when operating the diamond wire saw.
- Injuries from improper ergonomic techniques.
- Pinch and nip point injuries.
- Release of contaminants to the environment
- Fires or sparks from friction heated wire

Controls implemented to minimize or eliminate these hazards include:

- Noise level monitoring and hearing protection devices
- Work gloves to protect the normal latex gloves from ripping on sharp surfaces
- placing diamond wire in bag or wrap to keep from rubbing PPE during transport
- Saw design allows remote operation; operator need not be adjacent during cutting
- Saw design separates electrical system/components from the saw/water spray through hydraulic connection that reduces electrical connections and uncontained sprays.
- Saw and wire will be in a HEPA-filtered containment to control environmental releases.
- Before cutting the duct work, a fixative/encapsulate will be sprayed on the interior to minimize the release of contaminants to the environment.
- During cutting, the saw wire is sprayed with water (3 gal per min) for cooling and to suppress sparks and dusts. Cooling water is recaptured in the containment and diverted to 55-gal drums for recycle in the cooling system. Project Waste Management Plan addresses the disposition of the cooling slurry.

Hazards associated with the use of the circular saw, chain saw, and sawzall include:

- Exposure to noise levels in excess of the PEL.
- Cuts and lacerations when operating saw.
- Injuries from improper ergonomic techniques.
- Pinch and nip point injuries.
- Release of contaminants to the environment
- Fires or sparks from friction from blade catching.

Controls implemented to minimize or eliminate these hazards include:

- Noise level monitoring and hearing protection devices
- Work gloves to protect the normal latex gloves from ripping on sharp surfaces
- Placing circular saw or chain saw or sawzall in bag or wrap to keep from rubbing PPE during transport.

- Before cutting the duct work-expansion joints with the sawzall, a fixative/encapsulate will be sprayed on the interior to minimize the release of contaminants to the environment.
- When being used in a radiological control area, the saw will be in a HEPA-filtered containment to control environmental releases.

5.2.12 Fire Prevention and Protection. A loss of water pressure during DWS operation could result in a fire from over-heating or sparks from continued motion of the wire. Should a loss of water pressure occur, or the DWS wire break during the cutting of the ductwork, the cutting operation will be stopped immediately. Employees operating the DWS, circular saw, chain saw or sawzall maintain a visual contact with the saw throughout the cutting operation. The cutting operation will not resume until the problem that caused the work stoppage has been corrected.

In addition, the following requirements will be adhered to:

- Maintain good housekeeping procedures to reduce fire hazards and to provide safe routes of egress should a fire occur.
- Provide the appropriate number and types of fire extinguishers for the operation being performed.
- Inspect fire extinguishers monthly and maintain an inspection log.
- Conduct frequent and periodic inspections to identify fire hazards such as:
  1. Unnessary accumulations of combustibles
  2. Unnessary accumulations of flammables, and
  3. Sources of ignition (i.e., faulty wiring, sparks, open flames, etc.)
- Remove all fire hazards promptly
- Smoking or other ignition sources will be prohibited in flammable storage or other fire hazard areas.
- Post emergency telephone numbers near telephones and evacuation maps in appropriate locations,
- Evacuation drills will be practiced.

A rapid and effective response in the event of fire will be accomplished by training employees in:

- Fire hazard recognition;
- Fire hazard prevention;
- Fire extinguisher use; and
- Emergency and evacuation routes.

5.2.13 Applying Surface Contaminant Fixative. In order to enhance contamination control and minimize potential uncontained releases of contaminants, a fixative shall be applied to the inner surfaces of the ducts prior to cutting or moving the cut concrete duct pieces. A fixative coating shall be applied to the exterior duct surface, in those locations where existing coating integrity is suspect due to visible evidence of flaking or scraping.

5.2.13.1 Fixative Material and Application. Due to the variety of surfaces to be addressed, a variety of surface fixatives are planned. The Material Safety Data Sheets (MSDS) for fixative coatings are provided as Attachment 7 of this ESHERP.

a. Inner surfaces of expansion joints. The fixative material applied to these metal surfaces will be a strippable temporary layered coating, **STRIPCOAT TLC-FREE**, distributed by Bartlett Services, Inc. of Plymouth, MA (or equivalent). The TLC is a modified, ammonia-free, acrylic paint that can be applied with industrial "airless" spray equipment, paint rollers or brushes. The TLC is a non-toxic coating which when applied, cures quickly and forms a strong impermeable barrier between hazardous materials and the environment. The TLC shall be applied in accordance with manufacturer's recommended procedures to all inner surfaces of the duct expansion joints using air-less or low-pressure (garden-type) sprayers. Follow-up spot applications may be accomplished with brush and/or roller.

b. Inner surface of air ducts. Inner concrete surfaces are porous and may have significant and varying amounts of surface dusts on horizontal and vertical surfaces. To ensure adequate adherence of the fixative to the inner concrete surfaces, a surface preparation step will be used prior to applying the fixative.

- Surface dust will be reduced/minimized by applying a wetting agent, **TECHXTRACT**, distributed by Active Environmental Technologies, Inc, Mt Holly, NJ. This proprietary product is a water-based mixture of surfactants, emulsifiers, buffers, ethylene glycol, isopropanol and sodium hydroxide. The mixture shall be applied in accordance with manufacturer's recommended procedures to all inner concrete surfaces of the duct using air-less or low-pressure (garden-type) sprayers for a fine mist. The surfactant in the mixture allows the capture of the loose, dry dusts into the moisture layer; its removal with a HEPA-filtered wet/dry vacuum provides a uniform preparation of the porous concrete surface prior to the application of the fixative.
- Dusts remaining on the surface and in the pores of the concrete shall be fixed through the application of a **LATEX BLOCK FILLER**, supplied by Benjamin-Moore & Co, Montvale, NJ (or equivalent). The LBF is a water-based, heavy-bodied latex paint used as a filler for masonry block construction. It shows the excellent hardness and durability of latex paints as well as the bridging and filling property necessary to seal masonry block. The LBF shall be applied in accordance with manufacturer's recommended procedures to all inner surfaces of the concrete duct using air-less or low-pressure (garden-type) sprayers. Follow-up spot applications may be accomplished with brush and/or roller.

c. Outer surface of air ducts. The outer surface coating of the duct exhibits areas of visual flaking and exposed surfaces where samples were taken. To provide a contained surface and preclude further flaking and exposure during transportation, these localized areas shall have a fixative applied. Surface will be prepped by removing loose flakes by hand with a broad blade putty knife or brush, under bagged conditions to capture removed materials. Following surface prep, the fixative, **L-B-C® TYPE III**, supplied by Fiberlock Technologies, Inc., Cambridge, MA (or equivalent) shall be applied. L-B-C® Type III is a high-solids, thermoplastic-elastomeric water-based copolymer, blended specifically to form a durable and flexible encasement barrier between lead paint and the environment. The L-B-C shall be applied in accordance with manufacturer's recommended procedures to all visibly stressed outer surfaces of the concrete duct as spot applications with brush and/or roller.

5.2.13.2 Hazard Assessment of Fixative Material.

Personal exposures during application of fixatives include airborne vapors containing organic vapors and airborne particulate consisting of polymer and other additives that dry during application. Because of the number of propriety ingredients in the various fixatives, the exact trace elements in the fixatives are unidentified. However, all fixatives are commercially available and are sold for both commercial and residential application.

The fixatives have hazards similar to any acrylic or latex paint:

- in poorly ventilated areas, trace components and residual monomer vapors may be irritating to the eyes, skin, mucous membranes and respiratory tract;
- prolonged exposure may produce symptoms of headache, nausea and reddening of the skin;
- none have been identified as a potential carcinogen; although they may produce suspect fibers and lung hazards when sanded dusts of the cured product are inhaled
- the materials used as proposed, are stable, non-reactive, and will not undergo hazardous polymerization;
- the fixatives are non-flammable, but residues left after evaporation may burn.

5.2.13.3 Control of Exposure to surface contamination fixatives.

Airborne vapor concentrations shall be evaluated using a photoionizing detector (PID). Exposures to airborne particulate concentrations shall be controlled through the use of respiratory protective equipment. In the event airborne vapor concentrations are detected by the PID, work shall cease until airborne concentrations are reduced to none detectable levels. Ventilation may be used to achieve and maintain the non-detectable airborne concentration limit.

The establishment of a none detectable airborne vapor concentration during application of fixatives will assure that workers inside the ductwork are protected to ceiling limit recommended by the American Conference of Governmental Industrial Hygienists and OSHA Permisable Exposure Limits (PELs). Personal airborne particulate concentrations shall be controlled through the use of respiratory protective

equipment. Employees working inside the ductwork shall be required to wear full-face piece respirators with multi-purpose organic vapor/particulate cartridges.

5.2.13.4 Mitigative Actions for Application of Fixative.

a. Applications outside the ducts. Under normal uses of these fixatives, general ventilation (either natural or mechanical) would be expected to be satisfactory in mitigating vapors during application of the fixative. For application to surfaces outside the ducts, appropriate mitigative measures include:

- Brushes and/or rollers shall be used to minimize airborne materials;
- supplement with local exhausts when natural ventilation is calm;
- wear protective eyewear or goggles, if not in a mask;
- wear gloves impervious to water and paints;
- wear coveralls to protect from paint spray, drip or splash; and
- wear PPE commensurate with the exposure to the contaminant being fixed.

b. Applications inside the ducts. In this project fixatives will need to be applied inside the ducts, where the loose contamination may preclude additional mechanical ventilation beyond that supplied by the existing negative pressure ventilation system.

- As much as possible, personnel shall stand "up-stream" to the wind flow from the negative pressure ventilation system when applying fixative;
- Air-less or low-pressure sprayers shall be used to minimize airborne particulate materials;
- During initial application of fixatives, personnel shall be wearing PPE appropriate to the potential for exposure to radioactive contaminants, which will provide protection from exposure to fixatives particulates;
- Entry into and work performed in the ducts during application of the fixative shall be managed by the BNL confined space procedures in ESH Standard 2.2.4, as described in Section 5.2.9, above; and
- PID monitoring for airborne organic vapor concentrations shall be performed.

The effectiveness of the fixative application shall be evaluated by surveys of removable radioactive material performed by project RCTs at representative locations of the surfaces after the fixative cures.

6.0 MONITORING

6.1 General

The hazardous contaminants of concern during the removal of above ground ducts include the following:

- Asbestos;
- Poly Chlorinated Biphenyls (PCB's);
- Lead;
- Radioactive Materials.

Physical hazards of concern include

- noise levels,
- direct external radiation exposure, and
- internal exposure from inhaled airborne radioactivity.

Monitoring will be performed for these hazards using direct reading instruments to ensure proper selection of engineering controls, work practices, and PPE so that employees are not exposed to levels that exceed permissible exposure limits or published exposure levels for hazardous substances and radiation. When assessing occupational hazard levels, ACGIH Threshold Limit Values (TLVs) will be applied when they are lower (more protective) than Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs). Air monitoring will be performed to identify Immediately Dangerous to Life and Health (IDLH) conditions, exposure over permissible exposure limits or published exposure levels, or other dangerous conditions such as the presence of flammable atmospheres or oxygen-deficient environments, and for airborne radioactivity.

Real time monitoring will be performed at the start of each definable feature of work and when there is a potential for airborne contaminant concentrations in the work area or release to the environment.

6.2 Monitoring Requirements

Direct reading, real time instruments or equipment necessary for site monitoring consists of

- an explosimeter or combustible gas indicator (CGI) to measure percent oxygen and lower explosive level (LEL) for identification of potentially explosive environments,
- a sound level meter measuring frequency weighted dBA,
- a MIE-Ram for the monitoring of total airborne particulate matter concentration,
- continuous air monitor, to detect airborne alpha radiation contaminants,
- a dose-rate meter (Bicron F Rem, Eberline RO-2 or equivalent) for the measurement of external radiation, and
- a ratemeter (Ludlum Model 3 or equivalent) with pancake g-m or scintillation detector for the measurement of alpha/beta/gamma (á/â/ã) contamination.
- the BGRR portal monitor to measure surface radioactive contamination, as individuals exit the work area

Action levels and data recording schedules are listed in Table 8.

6.2.1 Baseline Monitoring. URS-Dames&Moore will perform monitoring with direct reading instruments or air samplers prior to commencement of work to establish site baseline. Baselines will be established according to the following:

Constituent of Concern	Equipment	Required Sample
Combustible Gases	CGI	Five readings averaged over 5 min period
Oxygen Concentration	CGI	Five readings averaged over 5 min period
Noise	Sound level meter	Five readings averaged over 5 min period
Airborne lead	Mini-Ram	Five readings averaged over 5 min period
External Radiation	Bicron FRem or Eberline RO-2	Survey of work areas to supplement data provided by BGRR
á/â/ã Radiation Contamination	Ludlum Model 3 or ESP-2 w/ pancake or á scintillator	Survey of work areas to supplement data provided by BGRR
Particulate Matter	Mini-ram	One sample averaged over 4 hours
Radiation Particulate	High volume sampler	One sample averaged over 4 hours

6.2.2 Personal Monitoring. Personal monitoring for airborne concentrations of lead, asbestos and PCB's will be performed according to the following methods:

Airborne Contaminant	NIOSH Method Number
Asbestos Fibers	7400
Lead	7082
Polychlorinated Biphenyls (PCBs)	5503

Personal samples will be collected on workers within their breathing zones. The worker/s most at risk (i.e. greatest potential exposure) will be sampled. The samples will be representative of sampled workers' 8-hour time-weighted average exposure. At the start of each definable feature of work, personal airborne asbestos, lead and PCB samples will be collected each shift for four days. All subsequent personal sampling for airborne asbestos, lead and PCB's will be conducted at a frequency of once per week thereafter. URS-Dames&Moore SMS No. 43, *Personal Monitoring (Industrial Hygiene)*, provides guidance and a record form for use in performing personal monitoring. A copy of results of all personnel air samples shall be provided to BNL.

6.2.3 Oxygen and Explosive Gas Monitoring. Air monitoring will be performed for the content of oxygen and explosive gases during access to confined spaces.

a. It is anticipated at this time that employees will have to enter confined spaces to perform their work tasks inside the ducts. In the event a confined space entry becomes necessary, the requirements established in the Confined Space Entry Procedure will be followed.

b. If the CGI indicates a concentration of explosive gas greater than 10 % of the lower explosive limit (LEL), then work activities at that location will be immediately shut down, personnel will be evacuated and BNL will be notified. Mitigation measures will be determined based on the source of the emission.

6.2.4 Particulate Matter Monitoring. While water cooling during concrete cutting with the diamond wire saw essentially eliminates dusts, it is prudent to monitor for airborne particulates during cutting operations. The particulates released into the air during this operation could possibly contain asbestos fibers, lead, PCB's and/or radioactive particles. An action level of 0.5 mg/m^3 has been established for this project based on the most restrictive TLV for known contaminants (airborne particulate PCBs). In the event this airborne concentration is exceeded outside of containment structures, work will cease until airborne particulate concentrations have dropped below the 0.5 mg/m^3 limit. Inside containment, a higher level of 5 mg/m^3 is established based on the use of respiratory protection and PPE. Dust control through HEPA-filtered ventilators and water cooling methods will be available to reduce the airborne particulates from diamond wire saw operations.

6.2.5 Radiation Monitoring. Radiation monitoring will occur on two levels: area monitoring using portable survey meters and personnel monitoring using individual thermoluminescent dosimeters (TLD's), breathing zone and/or lapel air samplers, and digital alarming dosimeters (DADs). The survey instruments and DADs are used to measure the dose rate in the work areas so as to be able to respond in an appropriate method in an appropriate time frame. The TLD's, air sample results, and the bioassay program provide the basis for a permanent record documenting the actual dose each worker receives.

6.2.5.1 Radiation Survey Monitoring. External radiation survey monitoring is performed using

- a portable survey meter, such as the Bicron µRem meter or the Eberline RO-2,
- a beta/gamma survey instrument, such as a Ludlum 3 with a Ludlum pancake probe detector, and
- an alpha survey instrument such as Ludlum 3 with an alpha scintillation probe detector.

The survey meter is capable of measuring background levels of radiation (expected to be 5 - 10 µrem per hour), and will be able to detect levels elevated above ambient. The survey instrument with either á or â/ã probe will identify elevated levels of radioactive materials. The combination of instruments will enable workers and health and safety personnel to recognize and respond to any radiation hazards. The frequency and extent of radiation surveys are discussed in Section 8.5, below.

Background radiation levels/operational response will be determined for each instrument daily by taking readings at a locations specified by BNL. Instrument checks will be performed and results will be recorded in accordance with BNL procedures, FS-SOP-2010.

If the radiation level at a work site exceeds expected levels identified on the RWP survey, the workers in that area will determine if this is from a localized source, such as the waste or sample container, or a general area level. This is accomplished by moving the meter away from the waste material and observing if the dose rate decreases. If the waste is determined to be the cause of the elevated readings, waste handling

will proceed normally employing ALARA considerations. If the dose rate is elevated throughout the area, the workers will cease work, move to an area with a reduced dose rate, and notify the Health & Safety personnel. Work in that area will not resume until the source of radiation is identified and appropriate mitigation measures are employed. If possible, discrete source of radiation should be segregated and shielded to minimize exposure to personnel.

6.2.5.2 Personnel Dosimetry. Each worker will be issued individual dosimeters (whole body, ring, extremity, self-reading or digital alarming) by BNL as indicated on the RWP. The dosimeter will be worn in accordance with the instructions contained in Table 9. These dosimeters will be read or processed periodically by BNL, with results recorded in the project logs. The individual worker may request to be notified of dosimetry results.

6.2.5.3 Bioassay. Each worker will have a whole body count and a urine analysis administered by BNL prior to being authorized to work on the site. A final whole body count and urine analysis will be conducted for each individual after the completion of their on-site duties or at interval directed by BNL. Additional whole body counts and urine bioassays may be performed as directed by BNL in accordance with the BNL RADCON Manual (Ref 2). Target radionuclides for the bioassays are identified in Section 5.2.3.1, above.

6.2.5.4 Airborne Radioactivity. Air sampling for radioactive particulates will be implemented in the work area as determined by the RWP. Sampling and analysis will be performed in accordance with BNL RCD Procedure No FS-SOP-1040, Airborne Radioactivity Sampling and Analysis. In general:

a. Samples will be obtained using an air pump with flow rate sufficient to meet the detection sensitivity required for the anticipated duration of the operation
b. Air is drawn through a glass fiber filter Gelman, Type A/E, 47 mm (1.8 inches) in diameter. These filters are rated at 99.98% efficient for DOP aerosol of 0.3 µm.
c. The pump flow rate will be measured before and after collection to correct for filter loading; the typical flow rate value is 1.5-2.5 liters per minute.
d. Pumps will be placed in the work area at the beginning of the shift and remain until the end of the potentially contaminating work.
e. Air filters will be placed on stainless steel planchettes, and the filters will be analyzed for gross alpha and gross beta radioactivity.
f. Filters will be counted on-site, using manually operated scalers with detectors sensitive to beta and alpha radiations.
g. A continuous air monitor (CAM) for alpha particulates will be provided by URS/D&M for use on this project, when its use is necessary by the requirements of the RWP for the task being performed.

The minimum air volume requirements will be met to achieve the required Derived Air Concentration (DAC) for air monitoring of Pu and Am per FS-SOP-1040, Airborne Radioactivity Sampling and Analysis.

6.3 Background Readings

Before any field activities commence, background levels at the site must be read and noted. Daily background readings must be conducted away from and upgradient of areas of potential contamination to obtain accurate results. Monitoring personnel must consider potential interferences such as engine exhaust.

6.4 Air Monitoring Frequency

Frequency and periodicity of monitoring is identified in Table 8. All site readings must be noted on the Air Monitoring Record form provided in Attachment 6, along with the date, time, background level, weather conditions, estimates of wind direction and speed, and the location where the background level was recorded.

6.5 Air Monitoring Laboratory Analyses

During site work, the BNL laboratory will analyze the radiological air monitoring samples. URS/D&M will send the PCB in air (NIOSH 5503) , Pb in air (NIOSH 7082), and fibers in air (NIOSH 7400) to the Eastern Analytical Services, Inc. laboratory. PCBs may require more than 24 hours to complete. Eastern Analytical Services, Inc estimates that the turnaround time for PCBs will take no longer than 5 days. Turn-around time for the other above mentioned analyses performed by the contract laboratory will take approximately 24 hours.

All samples will be screened for radiological contamination, before sending the samples to the applicable laboratory. If URS/D&M determines that the PCB in air, Pb in air, or the fibers in air samples contain radiological contamination, then URS/D&M will send such samples to DataChem for analyses as described above and will evaluate their contamination control practices and the adequacy of in place engineering controls.

URS/D&M estimates that the total time to review and validate the data, perform required calculations, and perform a QA review on calculations will take approximately 3 working days once it is received from the applicable laboratory. After URS/D&M reviews and validates the data, performs required calculations, and performs a QA review on calculations, the results will be documented and provided to the BNL BGRR Technical Contract Representative and the workers within 1 working day thereafter. Therefore, it will take approximately 4 working days from the time the data is received from the contract laboratory by URS/D&M to the time it is presented to BNL and the workers.

6.6 Free Release Surveys at US Ecology's Oak Ridge Facility

US Ecology RCTs will perform all release surveys from US Ecology's Oak Ridge, Tennessee Process Facility after volume reduction activities are complete. This activity is regulated under US Ecology's State of Tennessee Radioactive Materials license No. R-01037-B04, due to expire on February 29, 2004.

Table 8. Hazard Monitoring Methods, Action Levels, and Protective Measures

Hazard	Monitoring Method	Action Level	Data Recording Schedule*	Protective Measures
Oxygen deficient atmosphere	O_2 meter	$ 19.5% - # 23%	Periodically (every 30 mins) during confined space activities	
		< 19.5%	Withdraw from area immediately.	Cease Working
		> 23%	Withdraw from area immediately.	Cease Working
Explosive Gases	CGI	< 10% LEL	Continue investigation	
		> 10% LEL	Explosion hazard, withdraw from area immediately and contact BNL	Cease Working
Toxic dust outside containment	Particulate monitor	Up to 0.1 mg/m^3 (respirable fraction) above background in the breathing zone	Periodically (every 30 mins) during dusty activities	Level D
		0.1 - 0.5 mg/m^3 (respirable fraction)	Periodically (every 30 min) during dusty activities	Level C
		> 0.5 mg/m^3 (respirable fraction)	withdraw from area immediately	Cease Working
Toxic dust inside containment	Particulate monitor	0.1 - 5.0 mg/m^3 (respirable fraction)	Periodically (every 30 min) during dusty activities	Level C
		> 5.0 mg/m^3 (respirable fraction)	withdraw from area; allow dust to settle; review procedures	Cease Working
Noise	Sound Meter	> 85 dbA	Periodically (every 30 mins) during noisy activities	Ear plugs or protectors
Airborne Radioactivity	Particulate Sampler	0.1 DAC Am-241 : 2E-13 FCi/cm^3 Pu-238 2E-13 FCi/cm^3	High-volume sampling each shift	Review Procedures Track DAC-hrs
Airborne Radioactivity	Continuous Air Monitor	0.1 DAC Am-241 : 2E-13 FCi/cm^3 Pu-238 2E-13 FCi/cm^3	Continuous readout with conversion factor	Level C; post area
Radiation	RO-2 or microrem survey meter	Handling uncontained materials	Periodically (every 30 mins) during invasive activities	Level C
		100 mrem/hr	Periodically (every 30 mins) during invasive activities	Self Reading Dosimeters
Radioactive Contamination	Portal Monitor	Instrument Pre-set Level	Whenever exiting Radiation Buffer Area	If alarms, contact

Hazard	Monitoring Method	Action Level	Data Recording Schedule*	Protective Measures
* Indicates initial monitoring at beginning of invasive task; frequency may be increased, decreased or suspended at discretion of SISO.				

Table 9. Instructions for Wearing Radiation Dosimetry Badges

TEMPORARY & VISITORS TLD RADIATION MONITORING BADGE WEARERS INSTRUCTIONS

1. This TLD radiation monitoring badge allows BNL to evaluate your occupational exposure to external ionizing radiation. Please read this sheet carefully to ensure proper badge use.
2. Always wear the badge when in posted areas and whenever you work with radioactive materials.
3. Wear the badge on a prominent area of your torso; a pocket, belt, collar, etc. The TLD badge color and information label must face away from your body and not be covered by clothing or any other material.
4. Do not store the TLD badge in a radiation area or near radioactive materials. Place the TLD badge on the TLD badge board when not in use, preferably in an unused location (at the far right of the board.)
5. The TLD badge ***monitors*** exposure to ionizing radiation. It does not ***protect*** from radiation.
6. **DO NOT** open the TLD badge holder or tamper with the seals in any way. Protect the TLD badge from excessive heat, bright sunlight, humidity, or chemical vapors.
7. Report any lost or damaged badges to the person who issued the TLD badge, the Facility Support Health Physics Technician or the RCD Safety Representative
8. Never wear more than one TLD badge at the same time unless specifically instructed to do so by qualified supervisory personnel or your RCD Safety Representative.
9. **DO NOT** deface the badge or the TLD badge information label with the bar code in any manner. If necessary for identification purposes a removable label may be affixed to the back of the badge with the wearers last name & life/guest number.
10. Return the TLD badge on the day of the posted exchange date or when you leave BNL, whichever is first. The returned TLD badge should be placed in the box at the bottom of any TLD badge board. It may also be returned to the person who issued the badge. The TLD badge is not supposed to be removed from BNL grounds. In the event that it is inadvertently removed from the area it can be returned by mail to PERSONNEL MONITORING, Bldg. 535A, BROOKHAVEN NATIONAL LABORATORY, Upton, N.Y. 11973. If the TLD badge is returned through the mail please attach a note with the wearers name and phone number so they can be reached if any questions arise.
11. It is important to realize that if you do not return the TLD badge for prompt processing, we have no way to measure the exposure to the badge.
12. Anyone receiving a Temporary TLD badge is required to attend General Employee Radiation Training. (GERT.) Additional training (Rad Worker 1, Dispersibles, High Rad Area, etc.) may be required as indicated by your RCD Safety Representative. Contact your RCD Safety Representative for scheduling information.
13. Permanent TLD badge service is available if you plan to stay at BNL for more than three months. See your RCD Safety Representative to request permanent service.

SPECIAL NOTES:

Individuals under 18 years of age have special limits for exposure to ionizing radiation. See your RCD Safety Representative if you are under 18.

Pregnant women also have special limits for exposure to ionizing radiation. If you may be pregnant then consult your RCD Safety Representative.

Source: Attachment 1, HP-SOP-017, Guidelines for Initiating Dosimeter Service and Use of Dosimeters at BNL

7.0 PERSONAL PROTECTIVE EQUIPMENT

7.1 General

Personal protective equipment (PPE) shields or isolates the worker with protection against dermal contact, ingestion and/or inhalation of hazardous chemicals, volatile organics, metals and radionuclides. The careful selection and use of PPE will protect the respiratory system, skin, eyes, face, hands, feet, head, ears and body. PPE does not provide protection against exposure to penetrating radiation such as x-rays and gamma radiation. For protection from penetrating radiation, modified work practices and the ALARA principles of time, distance and shielding are effective protective measures.

Minimum PPE required in all BGRR-DP work areas includes hard hat, safety glasses with side shields, and substantial footwear. Safety glasses, protective eyewear and face shields will conform to ANSI Standard Z87.1-1989. Hearing protection will conform to ANSI Standard S3.19-1974. Details of URS-Dames&Moore's PPE Program are described in the Dames & Moore Group SMS No. 29, *Personal Protective Equipment*.

7.2 Levels of Protection.

URS-Dames&Moore will provide employees with PPE that will protect from the hazards and potential hazards likely to be encountered during site operations. PPE selection is based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the site, the task-specific conditions and duration, and the hazards and potential hazards identified at the site. The level of protection provided is increased when site conditions deem it necessary to reduce employee exposures to below permissible exposure limits and published exposure levels for hazardous substances.

7.2.1 Level A: Worn when the highest level of respiratory, skin and eye protection is needed. Activities requiring Level A PPE are not anticipated on this project.

7.2.2 Level B: Worn when the highest level of respiratory protection is needed. Level B PPE will consist of at a minimum:

- Supplied air respirator. Respirators may be positive pressure-demand SCBA or positive pressure demand, supplied air-line respirators. An escape bottle or 5-min escape mask is required when using the supplied air respirator in IDLH or potential IDLH atmospheres.
- Disposable chemical resistant, one piece suits with attached hood and booties (preferably Saranax™ Laminated Tyvek® or equivalent brand);
- Inner and outer chemical resistant gloves;
- Chemical resistant boots with steel toe and shank;
- Outer disposable chemical resistant boot covers made of elastomer, rubber or similar materia, Tyvek® or fabric type shall not be used; and
- Hard hat.

7.2.3 Level C: Worn when the criteria for using air purifying respirators are met. Level C PPE will consist of at a minimum:

- ! Air-purifying respirator with appropriate cartridges or canisters;
- ! Chemical-resistant and/or moisture resistant clothing consisting of:
  - coveralls or
  - hooded one- or two-piece chemical splash suit, or
  - chemical-resistant hood and apron, or
  - disposable chemical-resistant coveralls.
- ! Hard hat;
- ! Inner and outer chemical-resistant gloves;
- ! Chemical-resistant boots with steel toe and shank;

7.2.4 Level D: Worn as a work uniform when outside the area controlled due to radioactive materials. Level D PPE will consist of at a minimum:

- ! Coveralls;
- ! Work gloves
- ! Safety Boots, leather, or chemical resistant, with steel toe;
- ! Safety glasses or goggles;
- ! Hard hat with face shield (as required);

7.3 Respiratory Protection

Only respirators and cartridges/filters approved and certified by the National Institute for Occupational Safety and Health (NIOSH) under 42 CFR Part 84 shall be used. Details of URS-Dames&Moore's Respiratory Protection Program are described in the Dames & Moore SMS No. 42, *Respiratory Protection*.

If air purifying respirators are required, full facepiece respirators, with combination organic vapor and high efficiency dust and mist cartridges, will be used. Half-face respirators will not be used. Respirators belong to, and are only used and maintained by, the individual to whom they have been issued. Each URS-Dames&Moore and subcontractor employee who anticipates working onsite must be trained, fit tested, and declared medically fit to wear respiratory equipment prior to participating in field activities.

7.4 Donning an Ensemble of PPE

Procedures for donning a protective ensemble are important to insure success in the safety of the worker inside the PPE and are provided in Tables 10a and 10b. These procedures may be modified depending on the particular type of suit and/or when extra gloves and/or boots are used. These procedures assume that the wearer has previous training in self contained breathing apparatus (SCBA) use and decontamination procedures. Assistance should be provided for donning and doffing, since these operations are difficult to perform alone, and solo efforts may increase the possibility of suit damage.

Table 10a. Procedures for Donning Level B PPE [a,b,c]

1. Inspect the clothing and respiratory equipment before donning.
2. Adjust hard hat or headpiece if worn, to fit user's head.
3. Open back closure used to change air tank (if suit has one) before donning suit.
4. Standing or sitting, step into the legs of the suit; ensure proper placement of the feet within the suit; then gather the suit around the waist.
5. Put on chemical-resistant safety boots over the feet of the suit. Tape the leg cuff over the boot tops.
   - If additional chemical-resistant boots are required, put these on now.
   - Some one-piece suits have heavy-soled protective feet. With these suits, wear short, chemical-resistant safety boots inside the suit.
6. Hook up the air line, put on air tanks and harness assembly of the SCBA. Don the facepiece and adjust it to be secure, but comfortable. Do not connect the breathing hose; open valve on air tank or air supply.
7. Perform negative and positive respirator facepiece seal test procedures.
   - To conduct a negative-pressure test, close the inlet part with the palm of the hand or squeeze the breathing tube so its does not pass air, and gently inhale for about 10 seconds. Any inward rushing of air indicates a poor fit. Note that a leaking facepiece may be drawn tightly to the face to form a good seal, giving a false indication of adequate fit.
   - To conduct a positive-pressure test, gently exhale while covering the exhalation valve to ensure that a positive pressure can be built up. Failure to build a positive pressure indicates a poor fit.
8. Depending on type of suit:
   - Put on long-sleeved inner gloves (similar to surgical gloves).
   - Secure gloves to sleeves, for suits with detachable gloves (if not done prior to entering the suit).
   - Additional overgloves, worn over attached suit gloves, may be donned later.
9. Put sleeves of suit over arms as assistant pulls suit up and over the SCBA. Have assistant adjust suit around SCBA and shoulders to ensure unrestricted motion.
10. Put on hard hat, if needed.
11. Raise hood over head carefully so as not to disrupt face seal of SCBA mask. Adjust hood to give satisfactory comfort.
12. Begin to secure the suit by closing all fasteners on opening until there is only adequate room to connect the breathing hose. Secure all belts and/or adjustable leg, head, and waistbands.
13. Connect the breathing hose while opening the main valve.
14. Have assistant first ensure that wearer is breathing properly and then make final closure of the suit.
15. Have assistant check all closures.
16. Have assistant observe the wearer for a period of time to ensure that the wearer is comfortable, psychologically stable, and that the equipment is functioning properly.

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[a] Source: Based on EPA Office of Emergency and Remedial Response, Hazardous Response Support Division, Field SOP for Site Entry, 1985.

[b] Perform the procedures in the order indicated.

[c] When donning a suit, you may use a moderate amount of a powder to prevent chafing and to increase comfort. Powder will also reduce rubber binding.

Table 10b. Procedures for Donning Level C PPE

Equipment Used: Full-face air purifying respirator, hardhat, Tyvek® coveralls, inner surgical-style gloves, outer chemical-resistant gloves, chemical-resistant boots or boot covers, duct tape.

1. Inspect the clothing and respiratory equipment before donning.
2. Adjust hard hat or headpiece if worn, to fit user's head.
3. Don the Tyvek® coveralls and secure all closures (zippers, etc) [a]
4. Put on the boots and/or boot covers, placing the leg cuffs of the coveralls over the boot;
5. Tape the cuffs in place on the boots [b]
6. Put on the inner surgical gloves;
7. Put on the outer gloves, place the coveralls sleeve over the gauntlets of the gloves, and tape the gloves in place [b,c]
8. Don the respirator and adjust it to be secure, but comfortable.[d] Perform negative and positive respirator facepiece seal test procedures.
   - To conduct a negative-pressure test, close the inlet part with the palm of the hand or squeeze the breathing tube so its does not pass air, and gently inhale for about 10 seconds. Any inward rushing of air indicates a poor fit. Note that a leaking facepiece may be drawn tightly to the face to form a good seal, giving a false indication of adequate fit.
   - To conduct a positive-pressure test, gently exhale while covering the exhalation valve to ensure that a positive pressure can be built up. Failure to build a positive pressure indicates a poor fit.
9. Put on the hardhat.[e]

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a After donning the Tyvek® coveralls, move around to see that the coveralls fit well; check for tightness in the crotch (squats) and shoulders (shrugs).
b Bend your arm/leg prior to taping to assure freedom of movement.
c If a significant amount of “over the head” work will be done, consider taping the gloves over the coverall sleeves.
d If greater skin protection is needed, tape the hood of the protective suit to the facepiece.
e For added stability, the hard hat can be taped to the protective suit’s hood.

7.5 Evaluating Fit.

Once the equipment has been donned, its fit should be evaluated. If the clothing is too small, it will restrict movement, thereby increasing the likelihood of tearing the suit material and accelerating worker fatigue. If the clothing is too large, the possibility of snagging the material is increased, and the dexterity and coordination of the worker may be compromised. In either case, the worker should be recalled and better fitting clothing provided.

7.6 Doffing an Ensemble of PPE

Procedures for doffing a protective ensemble are important to ensure the success in the safety of the worker inside the PPE and are provided in Table 11. These procedures may be modified depending on the particular type of suit and/or when extra gloves and/or boots are used. These procedures assume that the wearer has previous training in SCBA use and decontamination procedures. Assistance should be provided for donning and doffing, since these operations are difficult to perform alone, and solo efforts may increase the possibility of PPE damage and subsequent spread of contamination.

Table 11. Procedures for Removal of PPE at a Step-Off Pad

Before stepping out of the contamination area on to the step-off pad, the worker should:

1. Remove exposed tape.
2. Remove rubber overshoes.
3. Remove outer gloves.
4. Remove hood front to rear.
5. Remove coveralls (Tyvek), inside out, touching inside only.
6. Remove respiratory protection, as applicable.
7. Remove tape or fastener from inner shoe cover, as applicable.
8. Remove each shoe cover, placing shoe onto step-off pad.
9. Remove inner gloves.
10. Perform whole body frisk or survey in personnel contamination monitor.

8.0 SITE CONTROL

8.1 General

The purpose of site control is to minimize potential contamination of workers, protect the public from the site's hazards, and prevent vandalism. Site control is especially important in emergency situations. Several site control procedures will be implemented to reduce worker exposure to radiological, physical, biological, and safety hazards. Site controls will be identified in project specific Radiological Work Permits developed by BNL to support the project performance.

8.2 Radiological Work Permit

Prior to the start of work, the PHSM and the LRCT will assist BNL in completing a Radiological Work Permit (RWP) for project work. Following approval by BNL, the RWP will be posted at the access point to each work area. In conjunction with the Work Permit and the Temporary Procedure, the RWP will be used to inform site personnel of the radiological and safety controls to be followed during site activities. Personnel will sign a record form acknowledging having read and agreeing to adhere to the RWP conditions. The RWP will include the following information:

- Description of work;
- Work area radiological and hazardous material conditions;
- Dosimetry requirements;
- Training requirements for entry;
- Protective clothing and respiratory protection requirements;
- Radiological control coverage requirements and stay time controls;
- Limiting radiological/hazardous conditions that may void the RWP;
- Special dose or contamination reduction considerations;
- Special personnel frisking requirements and use of the BGRR portal monitor;
- Date of issue and expiration; and
- Authorizing signatures.

8.3 Work Zones

Work zones will be divided into three general area designations: the Contamination Area/Exclusion Zone, the Radiological Buffer Area/Contamination Reduction Zone, and the Uncontrolled Support Zone. The initial site layout and zone boundary designations will be described in the Temporary Procedure for Mobilization. Subsequent zone boundary changes, relaxations and additions will be described in Project

temporary procedures developed prior to performing that portion of the project. The detailed descriptions of each zone are as follows:

8.3.1 Contamination Area/Exclusion Zone

The Contamination Area/Exclusion Zone (CA/EZ) is defined as the area within the inner boundary of the Radiological Buffer Area/Contamination Reduction Zone (RBA/CRZ), such as those areas adjacent to active duct sectioning work sites and as otherwise defined in the Comprehensive Work Plan. This zone will be clearly delineated with psting, tape and a barrier to prohibit unauthorized access by untrained personnel. This area has known or potential contamination and the highest potential for exposure to hazardous radiation levels. Therefore, proper PPE and ALARA practices must be used in this area. Specific PPE will be as required by the RWP or BNL Work Permit, but in general:

- Level C PPE will be utilized during all activities involving access to contamination confinement areas or until loose materials have been evaluated or fixed.
- Level D PPE will be the minimum protection in the RBA/CRZ during periods when cutting operations are not being performed.

The outer boundary of the RBA/CRZ is called the hotline. The hotline separates the area of known or potential contamination from the rest of the site. The hotline will be established by visually surveying the site for signs of contamination, providing sufficient space to protect personnel outside the zone, allowing an adequate area in which to conduct site operations, and reducing the potential for contaminant migration. Persons who enter either the RBA/CRZ or CA/EZ will wear the appropriate level of PPE for the degree and types of hazards present at the site.

8.3.2 Radiological Buffer Area/Contamination Reduction Zone

The purpose of the Radiological Buffer Area/Contamination Reduction Zone (RBA/CRZ) is to reduce the possibility that the uncontrolled support zone (SZ) will become contaminated or affected by the site hazards. The RBA/CRZ for this project will be defined as the area in the yard adjacent to the building 704. Because of the decontamination procedures, the degree of contamination in the RBA/CRZ will decrease as one moves from the hotline to the uncontrolled SZ.

Initially, the RBA/CRZ will be established outside the areas of known or potential contamination. A contamination reduction corridor, which is an access control point between the CA/EZ and RBA/CRZ, will be established for both personnel and equipment. The corridor will consist of the appropriate number of decontamination steps necessary to address the suspected contaminants at the particular site.

An additional RBA/CRZ may be established around the Investigation Derived Waste (IDW) drum/storage area to be established. Liquid and solid IDW will be handled and stored in accordance with the Project Waste Management Plan.

Personnel in the RBA/CRZ will be required to wear at least Level D PPE or PPE that is one level less than that worn in the CA/EZ. Personnel in the RBA/CRZ will be prepared to enter the CA/EZ in case of emergency situations. The RBA/CRZ will have one accessible point to the CA/EZ.

8.3.3 Support Zone

The uncontrolled support zone (SZ) is the uncontaminated area where workers are not to be exposed to hazardous substances or dangerous conditions. The SZ is the appropriate location for the command post, first aid station, equipment and supply center, and other administrative or support functions that are necessary to keep site operations running efficiently. The SZ for the BNL BGRR Above Ground Ducts Removal Project will be defined as those areas outside of and beyond the fenceline of the project area not previously established as an CA/EZ or RBA/CRZ. Consistent with BNL use of Bldg 704, limited portions of the building may be designated as SZ and used for administrative support functions.

Potentially contaminated clothing, equipment, and samples must remain outside the uncontrolled SZ until decontaminated. However, personnel located in the uncontrolled SZ must receive instruction in proper evacuation procedure in case of hazardous substance emergency. No specific PPE requirements are needed in the uncontrolled SZ, except that minimum PPE required in all BGRR-DP work areas includes hard hat, safety glasses with side shields, and substantial footwear.

8.4 Work Zone Rules

Only authorized personnel will be permitted in the CA/EZ and RBA/CRZ. Entering these zones will require adherence to the Radiological Work Permit (RWP) and donning the required PPE prior to entry. A site entry and exit log will be maintained.

8.4.1 Prohibitions. While in the CA/EZ and RBA/CRZ, personnel are strictly prohibited from engaging in the following activities:

- Eating, drinking, smoking, chewing gum, chewing tobacco, etc.
- Possessing, using, purchasing, distributing, or having controlled substances in their system throughout the day or during meal breaks.
- Consuming or possessing alcoholic beverages, or reporting to work under the influence of alcohol (See Section 8.6, below)
- Taking prescription drugs (unless otherwise instructed by a licensed physician familiar with hazardous work operations).
- Working before or after daylight hours without special permission.
- Wearing contact lenses or eyeglasses when wearing a full facepiece respirator.

8.4.2 Dust suppression techniques, such as wetting or misting, will be implemented if visible dust is being generated at or near work areas.

8.5 Surveys

Surveys will be performed for the hazards presented in Section 5, above, to verify the effectiveness of physical design, engineering and administrative controls, and to identify areas requiring posting. Survey frequency and type will be identified in the Radiological Work Permit (RWP), Section 8.2. The surveys shall be performed as described in the BNL *Radiological Controls Manual* (RCM) Part 5, "Radiological Monitoring and Surveys" and associated BNL institutional RadCon procedures.

To the greatest extent possible, URS-Dames&Moore will use existing BNL procedures, in order to minimize communication error and maximize programmatic continuity.

8.5.1 Baseline Surveys for Radiation. Baseline surveys for â/ã radiation, and á/â⁻/ã radiation contamination in the work area will be conducted to characterize existing conditions for work planning as well as a post work comparison. Surveys will be conducted by BNL and/or URS-Dames&Moore prior to the developing the RWP for project activities.

8.5.2 Baseline Surveys for Hazardous Constituents. Baseline surveys for respirable particulates, explosive gases and oxygen level will be performed to characterize existing conditions for work planning as well as a post work comparison. Surveys will be conducted by URS-Dames&Moore utilizing the monitoring requirements established in section 6.0.

8.5.3 Temporary Containment Survey. Surveys of temporary containment arrangements for loose dusts and particulates will be conducted on the external of installed temporary containment to assist in determination of effectiveness.

8.5.4 Waste Sampling Surveys.

a. When initially accessing a duct interior, surveys for explosive gases, oxygen, and external ã radiation will be performed.

b. Sample containers shall be surveyed and labeled with on contact and 30 cm â⁻ /ã dose rates as well as á/â⁻/ã contamination levels. The samples should be stored in a shielded container or staging area away from personnel to minimize overall dose for the job.

8.5.5 Work Site Surveys. Surveys for hazardous contaminants and external ã radiation dose rate and for á/â⁻/ã contamination in the work areas will be performed daily during operations as described in Section 6.

8.5.6 Decontamination/Equipment Release Surveys. Surveys for the decontamination of equipment and release for unrestricted use for this project will be performed in accordance with Section 10.6.3, below.

8.6 Workplace Substance Abuse Program

It is the policy of URS-Dames&Moore to maintain a drug-free work environment. All employees, contractors, contract employees, subcontractors, and subcontractor employees on this project are subject to the provisions of this policy, which implements the DOE regulations in 10 CFR Part 707, *Workplace Substance Abuse Programs at DOE Sites*.

URS-Dames&Moore expects you to refrain from illegal involvement with any controlled substance. Such practices are contrary to the maintenance of health and safety of the workforce and the work performance expected of all employees. If you are involved with drug or substance abuse, you should obtain treatment. Your failure of an authorized drug test, indications that a urine specimen has been adulterated or diluted, or failure to complete a course of treatment for drug or substance abuse will be subject to disciplinary action up to and including termination.

Individuals participating in this project will be tested for controlled substances when management has reasonable suspicion that an employee may be involved with drug or substance abuse while at the workplace. Reasonable suspicion may be based upon, among other things:

- Your involvement in a workplace accident, incident or other circumstances which resulted in or could have resulted in personal injury, or damage to property, and in which a manager or supervisor reasonably suspects that you were under the influence of or were impaired by the use of a controlled substance at the time of the accident, incident or circumstances.
- Your behavior which causes a manager or supervisor to have reasonable belief, based upon specific personal observation of your hearing, balance, reflexes, speech, judgment, appearance, odors, or other data, that you are under the influence of or are impaired by the use of a controlled substance.

In addition to reasonable suspicion testing, you are subject to random testing under the terms of the contract for this project.

Any employee who refuses to comply with properly authorized testing will be ineligible to continue work on this project and will be subject to disciplinary action, which may include termination of employment. An employee who submits to and fails to pass properly authorized testing will be subject to disciplinary action up to and including termination of employment.

All drug testing results will be maintained confidentially in a separate employee file. The Vice President Human Resources-URS-Dames & Moore will be the official custodian of all test results and records. Access to any of these test results and records will be permitted only on a need-to-know basis. Contact with all laboratories regarding test results or questions in general must be coordinated with the Vice President Human Resources-URS-Dames & Moore. Corporate policies and your rights and responsibilities as an employee are detailed in the *URS Corporation Policies and Procedures Manual*, October, 1999.

9.0 STANDARD SAFE WORK PRACTICES

9.1 Stop Work Authority

Each individual working on the BNL BGRR Above Ground Ducts Removal Project is responsible for adherence to the safety requirements of this document and every worker has the authority and the responsibility to enforce its provisions. This authority includes calling a "stop work" for imminent danger and Radiological Stop Work for poor performance. Training in "Stop Work" authority and responsibilities will be provided to all project personnel as part of Contractor/Vendor Orientation. Work will be resumed upon approval in accordance with the procedure.

9.2 General.

The following general safe work practices apply:

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited in contaminated or potentially contaminated areas, or where there is a possibility for the transfer of contamination.
- Contact with potentially contaminated substances should be avoided. Puddles, pools, mud, etc., should not be walked through. Kneeling, leaning, or sitting on equipment or the ground should be avoided, whenever possible. Monitoring equipment should not be placed on a potentially contaminated surface, such as the ground.
- Spillage shall be prevented to the extent possible. In the event that spillage occurs, the liquid should be contained, if possible and notify BNL.
- Splashing of contaminated materials should be prevented.
- Field crew members should use all their senses to alert themselves to potentially dangerous situations (i.e., presence of strong, irritating, or nauseating odors).
- Field crew members should be familiar with the physical characteristics of the investigation site, including:
  - Accessibility to associates, equipment, and vehicles
  - Communications
  - Contamination Areas and Radiation Areas (known or suspected)
  - Site access
  - Nearest water sources
  - Routes and procedures to be used during emergencies.
- A minimum number of personnel and equipment should be in the contaminated area (off the pavement), but only to the extent consistent with workforce requirements of safe site operations.
- All wastes generated during URS-Dames&Moore or subcontractor activities at the site must be disposed of as directed by the BGRR Subcontractor Technical Representative.

9.3 Health and Safety Equipment List

The following equipment list reflects the types of equipment that will be used and implemented over the life of the HSP. This list serves as a starting point for the SISO and RCT as they prepare for each phase of the work. The equipment listed below will be available during site activities.

PPE:
Hardhats
Safety glasses with side shields
Ear plugs or muffs
Tyvek® and polycoated Tyvek® coveralls
Chemical resistant steel-toed boots
Work or Canvas gloves
Nitrile gloves
Surgical vinyl inner gloves
Latex rubber gloves
Duct tape
Half-face and full-face respirators (NIOSH/MSHA approved)
Organic vapor/HEPA cartridges
5-minute escape respirators or canisters

Contamination and Site Control:
Plastic Sheeting (visqueen)
55 gal drums (for contaminated solids)
30-gal drums (for liquids)
Drum liners
Radiological control signs
Barricade tape and barricades
Wash tubs and scrub brushes
Decon solution.....Garden sprayer
Folding chairs or stools
Spill kit

Personnel Safety Support:
First Aid Kit
5 or 10 gal (15 minute) portable eyewash
Respirator sanitizing equipment
Drinking water
Gatorade or similar fluid replacements
Thermoluminescent dosimeters or equal
Self-reading pocket dosimeters
Sound Level Meter
Alpha scintillation detector/instruments (with detection limits # 50 CPM)
Geiger-Mueller detector/instruments (with detection limits # 100 CPM)
Micro-R and/or microRem meters (with detection limits # 0.2 mR/hr)
Wipe smears (1.75" dia)
High/low volume area air samplers and particulate filter media
Personal air samplers and 100/50 coconut shell charcoal sampling tubes
Sampling pump calibration equipment
Respirator fit-testing kit
Type ABC fire extinguishers
Site Communication Equipment
Compressed gas horn
Step-off pads

9.4 Buddy System

Workers will conduct all site activities with a buddy who is able to:

- Provide his or her partner with assistance.
- Maintain visual contact to observe partner for signs of chemical or heat exposure.
- Periodically check the integrity of his or her partner's protective clothing.
- Notify the site supervisor if emergency help is needed.

Prearrange hand signals or other emergency communication signals such as:

Signal	Meaning
- Hand gripping throat:	out of air, can't breathe.
- Gripping partner's wrist or placing both hands around waist:	leave area immediately
- Hands on top of head:	need assistance
- Thumbs up:	okay, I'm alright, I understand.
- Thumbs down:	no, negative.
- Arms waving upright:	send backup support.

9.5 Spill Control

9.5.1 Notification of Spills and Discharges. If a spill occurs and humans or the environment are threatened, contractor personnel will immediately contact BNL Emergency Services (2222 or 911 from an on-site telephone or 631-344-2222 from a cell phone), the SISO or Project Manager who in turn will notify the BGRR Subcontractor Technical Representative.

After spill response activities are completed, a Spill Report will be issued by URS-Dames&Moore to the BGRR Project Manager. This spill report will identify the cause and extent of the spill, any resulting contamination danger, and the corrective actions taken by URS-Dames&Moore and emergency personnel.

9.5.2 Spill Control Equipment. The following equipment will be kept at the site at all times to provide for the means to clean up an unexpected spill or discharge:

- Sand, clean fill, or other noncombustible absorbent;
- 55 gallon U.S. DOT 1A1 and 1A2 steel drums;
- Non-sparking shovels.

9.5.3 Spill Control Response. If a spill occurs at the site, the following actions will be immediately taken:

- Notify BNL Emergency Services (2222 or 911 from an on-site telephone or 631-344-2222 from a cell phone);
- Isolate and contain the hazardous spill and control access to the area;
- Do not allow anyone to touch or approach the spilled material without wearing the appropriate PPE;

- Direct personnel to stay upwind of the spill and to keep out of low areas;
- Keep combustibles away from the spilled material;
- Report to the Command Post when Fire/Rescue arrives;
- Use water spray to reduce vapors and dust as needed;
- Collect samples for analysis to assess if cleanup activities were adequate;
- Conduct any other actions as needed.

If radioactive or hazardous solid material is spilled at the site, the spilled material will be removed and placed into a dry container and labeled for disposal.

If a radioactive or hazardous liquid material is spilled, the spilled material will be absorbed with sand, clean fill, or noncombustible absorbent material. Once absorbed, the material will be placed into dry containers and labeled for disposal.

9.5.4 Decontamination. After the spill area has been controlled, personnel will undergo decontamination procedures as outlined in Section 10.

10.0 DECONTAMINATION PROCEDURES

10.1 Contamination Prevention

- Eating, drinking, smoking, application of cosmetics, and chewing tobacco or chewing gum are prohibited in the work area. These activities are permitted in the support zone only after monitoring and after the employees have removed their protective clothing and respirators and washed their hands and face.

- Disposable clothing, gloves, hard hats and respirators will be removed before leaving the work area. Upon exit all personnel will perform personnel contamination monitoring (frisking) with a portable meter and whole body monitoring using the PCM-1B portal monitor prior to leaving the controlled area.

- Employees will not kneel or sit on the ground or on drums, containers or other potentially contaminated areas.

- Monitoring and sampling instruments will be covered with visqueen or a plastic bag prior to entering the exclusion zone to the maximum extent practical without interfering with the operation of the instrument. This is to protect the instrument from contamination to the maximum extent possible.

- Good housekeeping is of primary importance for an effective decontamination program and is enforced accordingly. Discarded equipment (i.e., gloves, rags, coveralls, etc.) will be disposed of in appropriate containers with appropriate labels of contents and hazards.

- Employees will not remove any contaminated clothing or equipment from the site.

- Torn or otherwise damaged protective clothing, gloves, rubber boots, safety glasses, and hard hats will be discarded and replaced immediately.

10.2 Decontamination Area

The decontamination area in the RBA/CRZ shall be underlaid with plastic sheeting which shall be replaced when torn or heavily soiled, and at the end of each shift. All spent decontamination fluids (wash and rinse waters) will be handled as radioactive waste until laboratory results indicate otherwise. Fluids will be placed in proper containers, such as 55 gallon, metal, DOT approved drums, and handled and labeled in accordance with OSHA (or State equivalent), EPA, and DOT regulations.

Disposable clothing, gloves and spent respirator cartridges will be disposed of after each work shift. All personal protective equipment to be disposed of that has been used in areas of suspected or detected radiological contamination will be monitored prior to disposal. Any contaminated PPE will be placed in a separate plastic bag from uncontaminated PPE and properly marked and kept separate from

uncontaminated PPE. These items are to be placed in waste receptacles located inside the RBA/CRZ. Contaminated clothing will be disposed of in a manner consistent with DOE regulations for the level of surface contamination.

Employees will use a clean respirator and fresh cartridges on each work shift. Employees will be responsible for the cleaning and maintaining their respirators as described in URS-Dames&Moore SMS No. 42, provided in Dames & Moore Group *Health and Safety Program and Management System*, June 1999.

Used respirators, face shields, hardhats, safety glasses, etc., which have been surveyed as free from radiological contamination are to be cleaned by the employee at the end of each shift. Clean respirators are to be stored in respirator bags.

10.3 Personnel Decontamination

10.3.1 General Decontamination Procedures (Level D and Level C). Personnel should follow the general decontamination procedures outlines below for Level D and C protection:

a. Locate a decontamination area.

b. Establish a personnel decontamination station consisting of a hand-held radiation detector sensitive to the radiation of concern (á, â, or ã), a basin with soapy water, rinse basin with plain water, and a can with a plastic bag or liner.

c. Monitor boots and gloves for radioactivity.

d. Remove boots and outside gloves and discard them in a plastic bag.

e. Remove disposable suit and discard it in a plastic bag.

f. Monitor your body with the hand-held instrument or proceed to the radioactivity portal monitor and process through as instructed.

Upon leaving the contamination area, all personnel will proceed through the appropriate Contamination Reduction Sequence described above. All protection gear should be left on-site during lunch break following decontamination procedures.

10.3.2 Maximum Measures for Level C Decontamination. When operational conditions or monitoring results indicate the presence of significant amounts of contamination, the maximum measures for decontamination in Table 12 will be implemented by the SISO.

Table 12. Maximum Measures for Level C Decontamination

Station 1: Segregated Equipment Drop	Deposit equipment used on-site (tools, sampling devices and container, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in separate containers with plastic liners. *Segregation at the drop reduces the probability of cross-contamination.*
Station 2: Boot and Glove Monitoring	Monitor outer boot covers and gloves with sensitive radiation detector (á and â / ã)
Station 3: Tape Removal	Remove tape around boots and gloves, and deposit tape in a container with a plastic liner.
Station 4: Boot Cover Removal	Remove boot covers and deposit them in containers with plastic liner.
Station 5: Outer Glove Removal	Remove outer gloves and deposit them in a container with plastic liner.
Station 6: Suit and Boot Monitoring	Monitor splash suit, gloves, and safety boots with sensitive radiation detector (á and â / ã); segregate contaminated items.
Station 7: Cartridge or Mask Change	Remove facepiece and deposit it in the plastic-lined container. Avoid touching face with fingers. *If worker left Exclusion Zone only to rest, or to change cartridges or mask, this is the last step in decontamination. Mask or cartridges are exchanged, new outer gloves and boot covers are donned, joints are taped, and worker returns to duty.*
Station 8: Splash Suit Removal	With assistance of helper, remove splash suit or coveralls. Deposit it in a container with plastic liner. *Be sure to remove any radiation monitoring devices or dosimeters from the suit before discarding.*
Station 9: Inner Glove Removal	Remove inner gloves and deposit them in a lined container.
Station 10: Inner Clothing Removal	Remove clothing soaked with perspiration and place in lined container. *Do not wear inner clothing off-site until monitored when dry, since small amounts of contaminants might have been transferred in removing the disposable coveralls and could be masked by moisture.*
Station 11: Release Monitoring	Proceed to the portal monitor/frisking station for release monitoring.
Station 12: Field Wash	Shower if highly toxic, skin-corrosive, or skin-adsorbable materials are known or suspected to be present. Wash hands and face if shower is not available.
Station 13: Re-dress	Put on clean clothes.

10.3.3 Personnel decontamination requirements for Level B protection. Personnel at a minimum should follow the general decontamination procedures outlined below for Level B protection.

a. Locate a decontamination area.

b. Establish a personnel decontamination station consisting of a basin with soapy water, a rinse basin with plain water, and a can with a plastic bag.

c. Wash and rinse boots.

d. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross-contamination.

e. Remove outer boot covers and gloves. Deposit in container with plastic liner.

f. If worker leaves exclusion zone to change air tank, this is the last step in the decontamination procedure. Worker's air tank is exchanged, new outer gloves and boot covers are donned, joints taped, and worker returns to duty.

g. Boots, chemical-resistant splash suit, and inner gloves are removed and deposited in separate containers lined with plastic.

h. SCBA backpack and facepiece is removed. Avoid touching face with fingers. SCBA deposited on plastic sheets.

i. Proceed to the portal monitor/frisking station for release monitoring.

j. Hands and face are thoroughly washed. Shower as soon as possible.

10.3.4 Maximum Measures for Level B Decontamination. When operational conditions or monitoring results indicate the presence of significant amounts of contamination, the maximum measures for decontamination in Table 13 will be implemented by the SISO.

Table 13. Maximum Measures for Level B Decontamination

Station 1: Segregated Equipment Drop	Deposit equipment used on-site (tools, sampling devices and container, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in separate containers with plastic liners. *Segregation at the drop reduces the probability of cross-contamination.*
Station 2: Boot and Glove Monitoring	Monitor outer boot covers and gloves with sensitive radiation detector (á and â / ã)
Station 3: Boot Cover and Glove Wash	Scrub outer boot covers and gloves with decon solution or detergent and water.
Station 4: Boot Cover/Glove Rinse	Rinse off decon solution from Station 2 using copious amounts of water.
Station 5: Tape Removal	Remove tape around boots and gloves, and deposit tape in a container with a plastic liner
Station 6: Boot Cover Removal	Remove boot covers and deposit them in containers with plastic liner.
Station 7: Outer Glove Removal	Remove outer gloves and deposit them in a container with plastic liner.
Station 8: Suit and Boot Wash	Wrap SCBA regulator with plastic to keep out water. Wash splash suit, gloves, SCBA and safety boots. Scrub with long-handle scrub brush and decon solution. Wash backpack assembly with sponges.
Station 9: Suit, Boot, SCBA and Glove Rinse	Rinse off decon solution using water. Repeat as many times as necessary
Station 10: SCBA Tank Change	Exchange SCBA tank. *If worker left Exclusion Zone only to rest, or to change tank, this is the last step in decontamination. Tank ise exchanged, new outer gloves and boot covers are donned, joints are taped, and worker returns to duty*.
Station 11: Safety Boot Removal	Remove safety boots and deposit them in a container with a plastic liner.
Station 12: SCBA Backpack Removal	While still wearing facepiece, remove backpack and place on table. Disconnect hose from regulator valve.
Station 13: Splash Suite Removal	With assistance of helper, remove splash suit; deposit in container with plastic liner. *Be sure to remove any radiation monitoring devices or dosimeters from the suit before discarding.*
Station 14: Inner Glove Wash	Wash inner gloves with water.
Station 15: Inner Glove Rinse	Rinse inner gloves with decon solution.
Station 16: SCBA Face Piece Removal	Remove SCBA face piece. Deposit in container with plastic liner. Avoid touching face with fingers.
Station 17: Inner Glove Removal	Remove inner gloves and deposit in lined container.
Station 18: Inner Clothing Removal	Remove clothing soaked with perspiration and place in lined container. *Do not wear inner clothing off-site since there is a possibility that small amounts of contaminants might have been transferred in removing the disposable coveralls and could be masked by moisture*.
Station 19: Release Monitoring	Proceed to the portal monitor/frisking station for release monitoring
Station 20: Field Wash	Shower, if highly toxic, skin-corrosive, or skin-adsorbable materials are known/ suspected present. Wash hands/face if shower not available.

Station 21: Re-dress	Put on clean clothes.

10.3.5 Minimal Decontamination. Less extensive procedures for decontamination can be subsequently or initially established when the type and degree of contamination become known (i.e., the materials are adequately characterized to identify associated hazards) or the potential for transfer is judged to be minimal. These decontamination procedures generally involve external equipment washdown only.

10.3.6 Closure of the Personnel Decontamination Station. All disposable clothing and plastic sheeting used during the operation should be double-bagged and contained on-site or removed to an approved off-site disposal facility. Decon and rinse solution can be contained on-site or removed to an approved disposal facility. Reusable rubber clothing should be dried and prepared for future use. (If gross contamination had occurred, additional decontamination of these items may be required.) All wash tubs, pail containers, etc., should be thoroughly washed, rinsed, and dried prior to removal from the site.

10.4 Sanitation

Potable water will be made available at the site, either from a pressurized source or commercially-available bottled water. Drinking cups will be supplied so personnel will neither drink directly from the source of water nor have to share drinking cups. Sources of non-potable water shall be clearly labeled as such.

Washing facilities and a portable chemical toilet will be provided on-site, and will be located in the decontamination area or the support area. Soap, clean water, wash basins and single-use towels will be available for personnel use. Procedures for ensuring adequate field sanitation are provided in URS-Dames&Moore SMS No. 30, *Sanitation*.

10.5 Decontamination-Medical Emergencies

In the event of physical injury or other serious medical concerns, immediate first-aid may be administered as needed in lieu of further decontamination efforts. See Emergency Decontamination Chart in Attachment 8 for a decision tree for emergency decontamination.

10.6 Equipment Decontamination

Equipment should remain onsite until the end of the project, or until it is no longer needed to support project operations. At project completion, equipment that is potentially contaminated will undergo decontamination procedures by project personnel. The equipment will then be surveyed for residual radioactive materials by BNL FS as per Section 10.6.3, below. If detectable contamination is found, equipment will not be allowed to leave the site until additional decontamination and a re-survey by BNL to assure compliance with BNL release criteria.

10.6.1 Decontamination of Vehicles and Heavy Equipment. Where it is likely that vehicles or heavy equipment have come in contact with contaminated material, such equipment will be decontaminated and surveyed upon leaving the Controlled Area/Exclusion Zone (CA/EZ), as per Section 10.6.3, below.

10.6.2 Decontamination of Tools. When all work activities have been completed, contaminated tools (drill augers, hand trowels, shovels, etc.) shall be totally decontaminated. A job is NOT considered complete until the work area has been cleaned, all used material properly discarded and tools cleaned and properly stowed.

It is expected that all tools will be constructed of non-porous, non-absorbent materials. This will aid the decontamination process. Any tool, or part of a tool, which is made of a porous/absorbent material (that is, wood or cloth) shall be discarded and disposed of as a hazardous waste if it cannot be properly decontaminated.

Tools to be decontaminated will be placed on a decontamination pad or into a bucket and thoroughly washed using a soap solution and brushing, followed by a water rinse. All visible particles should be removed before the tools is considered clean. Visibly clean tools will be surveyed for radiological contamination before storage or release from the site.

10.6.3 Equipment Release Surveys and Criteria. Prior to release from the CA/EZ, surveys of all equipment and materials shall be conducted or verified by BNL Facility Support. The BNL Lead RCT can make the determination on whether to conduct independent free release surveys or verify contractor generated data.

All equipment and materials used in the RBA/CRZ and CA/EZ must be visibly clean. Equipment and materials used in the RBA/CRZ and CA/EZ must be checked for hazardous and radiological contamination. If some areas or surfaces of the equipment or materials are inaccessible, the LRCT must support the equipment or materials release based on the history of its use and the results of the work area monitoring.

Equipment and materials are checked for removable radioactive contamination by counting 47 mm or 1.75" diameter smears which are wiped over 100 cm^2 of the object being monitored. Equipment and materials are checked for fixed plus removable contamination by project personnel using a Geiger-Mueller or low background counter (for alpha, beta and/or gamma radiation). Any detectable contamination that is greater than the limits specified in Table 14 must be removed or reduced to levels that are below the limits in Table 14.

Prior to release for unrestricted use, inspections of all equipment and materials must be performed and documented by BNL Facility Support. Equipment and materials used in the contamination reduction and exclusion zones must be checked for radiation and contamination in accordance Contamination Survey Techniques, Procedure No. FS-SOP-1001, Revision 1. If some areas or surfaces of the equipment or materials are inaccessible, BNL must assess the release of the equipment or materials based on the history of its use and the results of the work area monitoring. BNL determines the appropriate analysis equipment to evaluate if release criteria have been met.

Table 14. Definition of Removable and Fixed Contamination Levels

Nuclide (See Article 232)	**Removable (dpm/100 cm^2) (See Article 232)**	**Total (Fixed + Removable) (dpm/100 cm^2) (See Article 232)**
U-natural, U-235, U-238 and associated decay products	1,000 alpha	5,000 alpha
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-129, I-125	20	500
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	200	1,000
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above. Includes mixed fission products containing Sr-90.	1,000 beta-gamma	5,000 beta-gamma
Tritium organic compounds, surfaces contaminated by HT, HTO and metal tritide aerosols	10,000	10,000

From Article 232:

[1] The values in this table apply to radioactive contamination deposited on, but not incorporated into the interior of the contaminated item. Volume activated materials are not included in these limits. Where contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for the alpha and beta-gamma-emitting nuclides apply independently (10CFR835.Appendix D.1).

[2] The amount of removable material per 100 cm^2 of surface area should be determined by swiping the area with a dry filter or soft absorbent paper while applying moderate pressure and then assessing the amount of radioactive material on the swipe with an appropriate instrument of known efficiency (10CFR835.Appendix D.4). For objects with a surface area of less than 100 cm^2, the entire surface should be swiped, and the activity per unit area should be based on the actual surface area (10CFR835.Appendix D.3). Except for Transuranics, Ra-228, Ac-227, Th-228, Th-230, Pa-231 and alpha-emitters, it is not necessary to use swiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual contamination levels are below the values for removable contamination.

[3] The levels may be averaged over 1 square meter provided the maximum activity in any area of 100cm^2 is less than three times the values in this table (10CFR835 Appendix D.3).

NOTE: This is a copy of Table 2-1, BNL RadCon Manual. Mention of Articles and Appendices refers to the BNL RadCon Manual, which is available for review on the web-based Standards Based Management System. [I-125 has been moved to a category consistent with 10CFR835].

11.0 EMERGENCY RESPONSE

Prior to work start-up, personnel will become familiar with the emergency response actions discussed in this section. The BNL BGRR will provide site-specific training to project personnel on the BGRR Local Emergency Plan.

The URS Site Industrial Safety Officer (SISO) will make this plan available for review and photocopying. Employees will also become familiar with the location of telephones, emergency medical facilities, fire extinguishers, and water supplies near the work areas. See Section 11.5 for emergency telephone numbers.

11.1 Emergency Recognition

In emergency situations, personnel will stop work immediately, evacuate the contamination area/exclusion zone, and report to the Operations Manager or SISO for further assistance and instructions. Emergency situations will be handled by BNL support personnel; however, initial response and first aid will be available by qualified onsite personnel.

The following will be considered emergency situations:

Fire/Explosion	Loss of Control of Radioactive Material
Release of Radionuclides	Radiation Overexposure of personnel
Release of Hazardous substances	Radioactive/Hazardous materials contamination
Accident/Injury	Natural Phenomena
Criminal Acts	Medical and Casualty incidents

For purposes of the BNL Emergency Response Plan, the project's Operations Manager is designated as the Local Emergency Coordinator. In case of a hazardous materials emergency, the Operations Manager or senior onsite supervisor will assume full control of the situation until the arrival of BNL emergency responders. The Operations Manager and SISO will report to the F/R Command Post and work with emergency response teams to identify and evaluate hazards. Emergency responses and communications will be coordinated and controlled through the onsite Incident Commander, who is designated by the BNL Emergency Response Plan.

11.2 Communications

All emergency communications shall be through BNL Emergency Services, at 631-344-2222 from a cellular/commercial phone, or Extension 2222/911 from an on-site phone. Communications equipment (walkie-talkies) used in the work zone will be compatible with that used by BGRR. The URS-Dames&Moore Administrative Location will have a cell phone and on-site radio communication capability.

11.3 Emergency Equipment and Supplies

URS-Dames&Moore shall provide at least one first aid kit with bloodborne pathogens supplies. A portable safety shower, and an eye flush shall be provided and maintained fully stocked at a first aid station which is in close proximity to the work, but not inside the RBA/CRZ or CA/EZ work area. First aid kit locations shall be specially marked and provided with adequate water and other supplies necessary to cleanse and decontaminate minor burns, wounds, or lesions.

Chemical fire extinguishers with a 2A-10B:C rating shall be located at radiological buffer areas/contamination reduction zones, on each piece of heavy equipment, near any portable diesel or gasoline fueling tank, and at the site administrative area.

11.4 Procedures for Handling Emergencies

In the event of an emergency, the information available at the time must be properly evaluated and the appropriate steps taken to implement the emergency response plan. The Operations Manager or senior onsite supervisor will assume command of the situation and will

- call the BNL Emergency Dispatch at 631-344-2222 from a cell/commercial phone, or
- call Extension 2222 or 911 from an on-site phone,
- evacuate personnel as needed, and
- take other steps as necessary to gain control of the situation.
- for evacuations, assemble for muster outside the fenced area at the URS-Dames&Moore administrative area

When reporting an emergency, provide the following information:

Name and location of person reporting.
Location of accident/incident.
Name and affiliation of injured party.
Description of injuries, fire, spill, or explosion.
Status of medical aid and/or other emergency control efforts.
Details of chemicals involved.
Summary of accident, including suspected cause and time it occurred.
Temporary control measures taken to minimize further risk.

Once emergency response agencies have been notified, the BGRR Subcontractor Technical Representative and the URS-Dames&Moore Project Manager will be notified immediately.

11.5 Medical Emergencies

Personnel will be alert for signs and symptoms of illnesses related to chemical, physical, and disease factors on-site. Severe injuries resulting from accidents and chemical overexposure must be recognized as emergencies and treated as such. At least two personnel trained in first aid (including blood borne pathogen training) and CPR will be present on-site. If a medical emergency occurs,

- the Operations manager or SISO will announce the emergency, upon which work must stop
- personnel will move to the decontamination area
- immediately call BNL Emergency Dispatch at 631-344-2222 from a cellular/commercial phone, or Extension 2222/911 from an on-site phone.
- Personnel with current first aid training must evaluate the injury or illness and determine its severity.

- Victims will be decontaminated prior to administering first aid (as long as this can be done without further injuring the victim).
- First aid will be performed to limit further injury or stabilize the victim.
- Personnel are not to move or transport victims unless doing so does not pose an immediate threat to their life, or if timely response of emergency medical services is impossible due to the remoteness of the site.

See Figure 2 for a map of the evacuation route to the BNL Emergency Medical Facility/Occupational Medicine Clinic.

During project mobilization, the SISO shall coordinate with the BGRR Subcontractor Technical Representative to invite medical emergency responders to the site to review site conditions and likely emergency scenarios. This request and the visit, if responders come, will be documented in the site files.

11.6 Fire/Explosion Emergencies

Fire and explosion will immediately be considered as an emergency. In case of a fire, URS-Dames&Moore personnel will not attempt to use fire extinguishers, but will evacuate to a secure location and the BNL Fire Department will be notified as soon as possible by dialing 631-344-2222 from a cellular/commercial phone or 2222/911 from an on-site phone. Only persons trained in fire suppression/fire control will attempt to handle large fires, and the necessary steps will be taken to prevent or limit injury. The URS-Dames&Moore Project Manager and the BGRR Subcontractor Technical Representative will be notified as soon as possible and will specify proper clean-up activities. Personnel must remain outside of the incident area until the area is deemed safe by the Operations Manager or SISO.

During project mobilization, the SISO shall coordinate with the BGRR Subcontractor Technical Representative to invite fire department emergency responders to the site to review site conditions and likely emergency scenarios. This request and the visit, if responders come, will be documented in the site files.

11.7 Location of Clinic

Brookhaven operates an occupational medicine clinic on site to support routine operations and first aid. The clinic is located on Bell Avenue, less than one-half mile from the project site. To reach the clinic, exit the project driveway. At the intersection turn left on Rutherford Dr and follow around the curve into Center

St. Go three blocks on Center St to Bell Ave. Turn right on Bell Avenue and the clinic is on your left. See Figure 2 for a map to the BNL Emergency Medical Facility/Occupational Medicine Clinic. Injuries beyond first aid are referred by BNL.

11.8 Emergency Contacts

Table 15. Emergency Contacts

Contact	Person or Agency	Telephone No.
Security Fire Ambulance Clinic Poison Control	BNL Emergency Dispatch	2222 or 911
BGRR Project Manager	Stephen Pulsford	7513
BGRR Subcontractor Technical Representative	Tom Jernigan	8244 631-728-3871 (H)
BGRR ESH&Q Manager	Stephen Musolino	4211
URS-D&M Nuclear Program Manager	William P. Duggan	631-981-3970 914-268-2568 (H)
URS-D&M Project Manager	Eric Goller	716-675-7130
URS-D&M Project Administrative Area - Bldg 701	Bill Jones URS Site Supervisor	4836 5743
URS-D&M Project Health & Safety Manager	Larry Luckett	2777 (W) 914-565-8166 (H)
URS-D&M Firmwide H&S Director/Medical	WorkCare, Inc	512-419-5440
To call a pocket pager at BNL, dial 3456, wait for a 2-second burst of tone, and then dial the 4 digit pager number. You will hear a series of short beeps after which: a) For voice pagers (beginning with 0-3): speak your name and number and deliver the message. Hang up. b) For digital pagers (beginning with 4-7): dial the telephone number you wish the party to call. Hang up.		

11.9 Reports

The Operations Manager or SISO will complete an Accident Investigation Report and submit it to the URS-Dames&Moore Project Manager. The URS-Dames&Moore Project Manager will submit the report to the BGRR Subcontractor Technical Representative within 24 hours of the following types of incidents:

- Job-related injuries and illnesses.
- Accidents resulting in significant property damage.
- Accidents in which there may have been no reportable injury or property damage, but which have a high probability of recurring with at least a moderate risk to personnel or property.

- Personnel Contamination Events in excess of levels Table 14
- Regulatory non-compliance

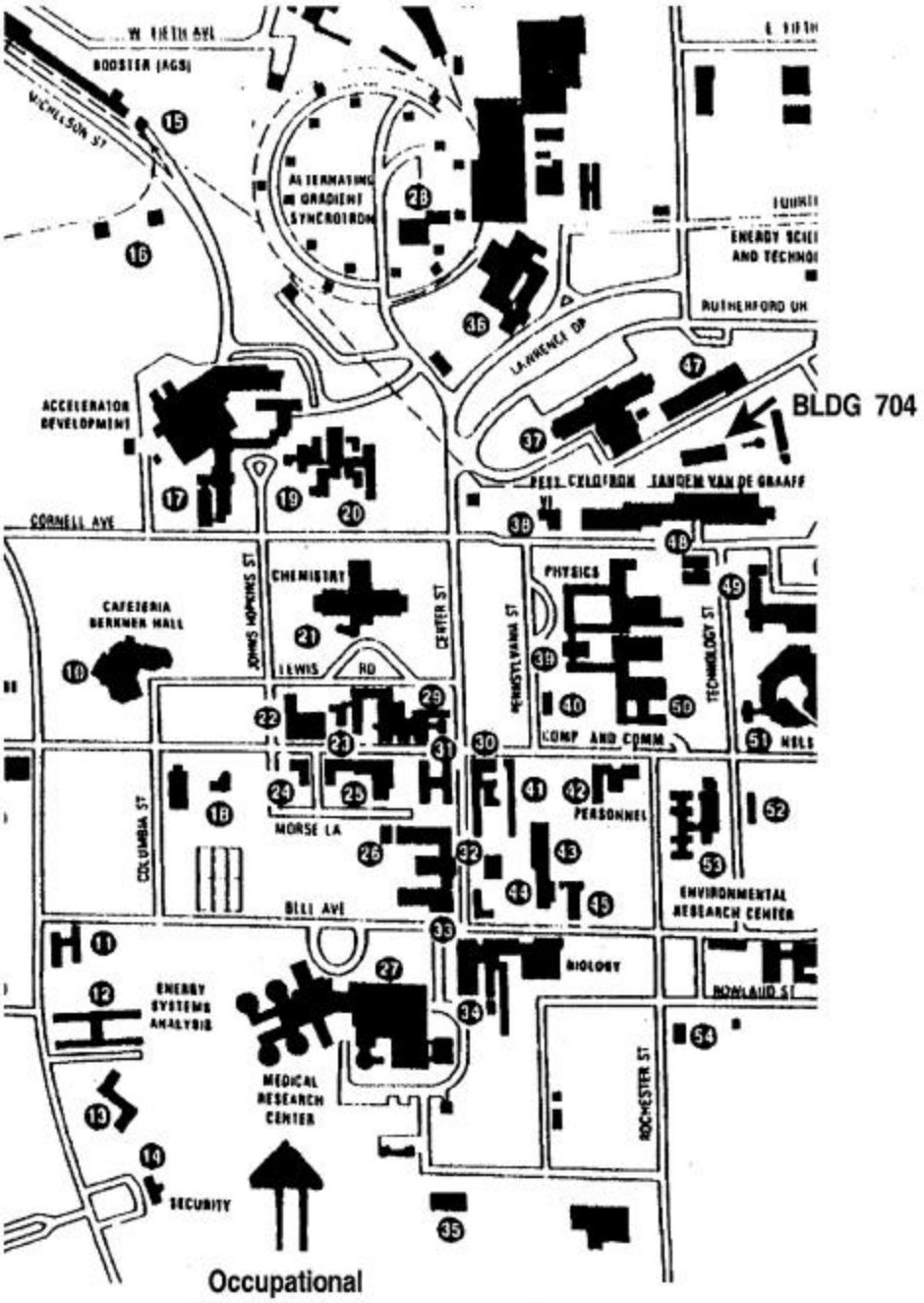
Reports shall utilize as appropriate

- SBMS Subject Area, Nonconformance & Corrective and Preventive Action
- HP-SOP-016, Radiological Awareness Reports
- ES&H Standard 1.1.0, Occurrence Reporting System

An accident that results in a fatality or in the hospitalization of three or more employees will be reported within 8 hours to the U.S. Department of Labor through the BGRR Subcontractor Technical Representative.

11.10 Emergency Response Plan

The BNL Laboratory Emergency Plan (Rev. 4, October 1996) will be available in the URS-Dames&Moore Administrative Location.



Brookhaven operates an occupational medicine clinic on site to support routine operations and first aid. The clinic is located on Bell Avenue, approximately one-half mile from the project site. To reach the clinic, exit the project site driveway. At the intersection turn left on Rutherford Dr and follow around the curve into Center St. Go three blocks on Center St to Bell Ave. Turn right on Bell Avenue and the clinic is on your left.

URS **Dames & Moore** 33 Comac Loop, Building 1, Suite B-1 Ronkonkoma, New York 11779	**DATE:** June 8, 2000 **JOB No.** 30822-286-023 **FIGURE:** 2	**BROOKHAVEN NATIONAL LABORATORY, UPTON, NY** **BGRR Above Ground Duct Removal** **Evacuation Route to Medical Clinic**

12.0 MEDICAL SURVEILLANCE

12.1 General

All project personnel performing work in potentially contaminated areas, regardless of length of employment at the site, are required to participate in the medical surveillance program. All employees who wear a respirator will have a physical exam and/or medical consultation indicating fitness for respirator wear prior to wearing a respirator on the site.

12.2 Project Specific Medical Surveillance

BNL will provide the following medical surveillance services to URS-Dames&Moore in support of this project effort:

- Radiological monitoring personnel dosimetry during the project for each individual.
- Whole body radiation count at project mobilization and demobilization, for each individual
- Urine bioassay, at mobilization

12.3 Medical Surveillance Program

12.3.1 Periodic Surveillance Examinations. The following medical surveillance intervals will be provided for all site employees working inside of the exclusion zone:

a. Prior to the start of work, all personnel must undergo a baseline medical examination. The results of the examination must be reviewed and the individual approved by an occupational physician as "fit for duty" or qualified to participate in hazardous site work prior to being permitted access to the contaminated or potentially contaminated areas of the site.

b. All personnel included in the program must obtain at least one medical examination per year during the term of site activity.

c. Upon completion of the project or at termination of employment, a termination exam should be completed within 30 days.

12.3.2 Non-scheduled medical surveillance examinations. A medical exam will be performed in the following situations:

a. If an employee develops signs or symptoms of illness related to potential workplace exposures.

b. When an employee develops a lost time injury or illness during the period of this contract.

c. After acute exposure to dangerous levels of any toxic or hazardous material.

The contents of the examination are at the direction of the occupational medicine physician, but should include the baseline medical examination and particulars relating to the event. A written statement allowing the employee to return to the work site after the illness must be provided to the employee's supervisor. This written statement must be signed by the Occupational Physician, and copies must be submitted to the Project Manager and the PHSM.

12.4 Specific Components of Exams

12.4.1 Preliminary Information. Prior to participating in the medical surveillance program, the following information will be provided to the examining physician:

a. Information on the employee's anticipated or measured exposure;

b. Proposed type, use and duration of PPE;

c. A description of the employee's duties;

d. Information from previous examinations not readily available to the examining physician.

12.4.2 Baseline Medical Examination. The baseline medical examination will consist of the following:

a. A medical and occupational history questionnaire with emphasis on the following systems: nervous, skin, lung, blood forming, cardiovascular, gastrointestinal, reproductive, as well as ears, nose, and throat.

b. A complete physical exam, including at least the following:
   1. Height, weight, temperature, pulse, respiration, and blood pressure
   2. Head, eyes, nose, and throat
   3. Ears (including an otoscopic examination of the ear for wax, and questionnaire)
   4. Chest (heart and lungs)
   5. Peripheral vascular system
   6. Abdomen (liver, spleen, and kidney)
   7. Musculoskeletal system
   8. Genitourinary System
   9. Skin
   10. Nervous system
   11. Pelvic, breast, and rectal (Guaiac) examination for women
   12. Testicular and rectal (Guaiac) examination for men

c. Tests
   1. Complete blood counts with differential
   2. 24 Item Blood Chemistry Panel, including

Calcium	Cholesterol	GGT
Phosphorus	Triglycerides	Uric Acid

Sodium	T. Protein	ALT (SGPT)
Potassium	Globulin	Glucose
Chloride	Albumin	Alk. Phos.
LDH	A/G Ratio	Iron
AST (SGOT)	BUN	HDL
T. Bili	Creatinine	T_4

3 Urinalysis (Microscopic examination), including:

Color and character	Specific gravity
pH	Protein
Acetone	Glucose

4. Chest X-ray (14 x 17 inch P-A performed for the baseline exam) read by a qualified "B Reader" for asbestos baseline.
5. Pulmonary function test to include, at a minimum:
   Forced vital capacity (FVC)
   Forced expiratory volume, one second (FEV_1)
   The FEV_1:FVC ratio
6. Standard 12-lead resting electrocardiogram (EKG).
7. Audiometric testing at 500, 1,000, 2,000, 3,000, 4,000, 6,000, and 8,000 Hz
8. Vision Testing R&L (Snellen)

d. Baseline Labwork for Hazardous Materials Workers
   1. Urinalysis (microscopic)
   2. Complete Blood Count (with differential)
   3. RBC Cholinesterase
   4. EKG Stress Test
   5. Blood Lead and zinc protoporphyrins
   6. Methemoglobin

e. Bioassay tests for uptake of radionuclides will be provided as indicated in Section 6.2.5.3, above.

12.4.3 Annual Medical Exam. The annual medical exam is similar to the baseline, with the following exceptions:

a. An annual questionnaire is administered in place of the Comprehensive Medical History Questionnaire.

b. Chest x-rays are not performed annually, but less frequently, depending upon age and regulatory requirements.

c. The EKG will be performed every 3 years for those under the age of 40, every 2 years for those aged 40 to 50, and annually for those over 50 years of age.

12.4.4 Termination Exams. The termination exam is conducted at the discretion of the Occupational Physician on the basis of an individual's medical and exposure history. All project personnel who worked in the exclusion zone or who may have otherwise been exposed to elevated levels of site contaminants will have a termination exam. The employee's supervisor should contact the Occupational Physician upon notification of termination to determine whether an exit exam is needed.

12.5 Medical Record Keeping

All medical and exposure records must be retained for a period of at least 30 years beyond an employee's last day of employment. A written notification of the storage location of all project associated medical/compliance records will be relayed to the BGRR Project Manager at the close of the project.

These records are accessible only by the participants and the consulting physician. Pertinent medical information may be shared with emergency medical facilities adjacent to hazardous work sites.

As required by OSHA standards, records of employee medical history must be made available upon request to the employees, employee representatives, and OSHA. The standard applies to all employers in general industry, construction and maritime operations whose employees are exposed to toxic substances and harmful physical agents. By providing workers with information they can use to detect, treat, and prevent occupational disease, the policy is intended to increase awareness of workplace hazards and allow workers to play a meaningful role in their own health management.

13.0 EMPLOYEE TRAINING

13.1 General

All employees working onsite who are exposed to hazardous substances, health hazards, or safety hazards; their supervisors; and the management responsible for the site must receive training before they are permitted to engage in hazardous waste operations that could expose them to hazardous substances or to safety or health hazards. Employees will not be permitted to participate in or supervise field activities until they have been trained to a level required by their job function and responsibility. An overview of the training and qualifications requirements for the project personnel is provided in Table 16.

13.2 Initial Training

General site workers engaged in hazardous substance removal or other activities that may expose workers to hazardous substances and health hazards will receive training required by Title 29 CFR, Part 1910.120 [HAZWOPER], which includes a minimum of 40 hours of offsite instruction, and a minimum of 3 days of actual field experience under the direct supervision of a trained, experienced supervisor. The HAZWOPER training must be current, including the 8 hour annual refresher course if necessary.

13.3 First Aid/CPR Training

The SISO shall maintain current certification in American Red Cross First Aid and cardiopulmonary resusitation (CPR) training or the equivalent. All other onsite personnel who are responsible for responding to site emergencies and incidents shall also maintain current certification in American Red Cross First Aid and CPR training or the equivalent. In addition, all first aid responders must receive Bloodborne Pathogens training as described in the Dames & Moore *Health and Safety Program and Management System*, June 1999.

13.4 Radiological Training Requirements

BNL will provide the following additional training as appropriate to enable personnel to safely perform assigned functions:

13.4.1 Contractor/Vendor Orientation - general safety information and safety information specific to the Brookhaven site operations (1.5 hours)

13.4.2 Radiation Worker I - All individuals who need unescorted entry into Radiologically Controlled Areas, Radiological Buffer Areas (RBAs) and/or Radiation Areas for limited times or durations must successfully complete *Radiological Worker I* training (RWT002).

13.4.4 Contamination Area Training. Workers whose job assignments involve entry into areas of potential radiological contamination and airborne radioactive material shall complete Site Specific *Contamination/High Contamination and Airborne Radioactivity Area* training (RWT-300).

13.5 Respirator Training and Fit Testing.

Workers whose job assignments involve entry into potentially hazardous airborne areas will be trained and fit tested on the appropriate respirator. Respirator training is provided in the 40-hour HAZWOPER course. Site-specific respirator fit testing will be provided by BNL.

13.6 Specialized Radiological Worker Training

Special radiological worker training shall be completed prior to conducting nonroutine operations, or work in areas with changing radiological conditions or in areas with the potential for high radiological exposure consequences. Work in these types of situations is not expected to be undertaken at the BNL site during this project. If conditions exist or are found that fit this criteria, then specialized training will be conducted prior to the commencement or continuation of site work, at the direction of the BGRR ESH&Q Manager.

13.7 Hazardous Materials Handling

All employees who will handle and package hazardous materials for shipment will have received training, specific to their job function, as required under the Department of Transportation (DOT) Hazardous Materials Training (HM-126F) requirements. Personnel on the project will receive awareness training on the hazards associated with asbestos, lead and PCBs.

13.8 Pre-Job and Site Safety Briefings

Prior to the start of operations at the site, the PHSM and the SISO will conduct a pre-job, site safety briefing, for all personnel involved in site operations which will include discussions of:

- Contents of this ESHERP;
- Scope of work to be performed;
- Types of hazards at the site and means for minimizing exposure to them;
- Radiological conditions in the workplace;
- Special radiological control requirements and hold points;
- Communications and coordination with other contractors;
- Types of monitoring that will be performed;
- Action levels for upgrade and downgrade of personal protective equipment;
- Personal protective equipment that will be used;
- Heat stress monitoring and control;
- Decontamination protocol;
- Site control measures, including ALARA and safe operating practices;

- Provisions for housekeeping and final cleanup;
- Emergency response procedures;
- Location and use of emergency equipment
- Site communication and evacuation signals and procedures;
- Overview of the Radiological Work Permit; and
- Conduct hazard communication training for all chemicals brought onsite. MSDS's for the chemicals brought onsite by URS-Dames&Moore will be maintained on-site in the Administration Trailer.

Subsequent site safety briefings will be conducted by the SISO prior to each shift to review pertinent safety issues, discuss any problem and discuss aspects of the shift's tasks. For each briefing, the SISO will complete a Site Safety Briefing form (see Attachment 5) which will be maintained on-site in the Administrative Location.

13.9 Record Keeping

Records of experience (resumes) and formal training certificates (qualifications cards) will be maintained in the project site files. Copies of all informal training rosters will be maintained onsite by the SISO. All site safety briefing forms will also be maintained onsite by the SISO.

Table 16. Overview of Training and Qualifications Requirements

Overview of Training and Qualifications Requirements	Project Management	Site Industrial Safety Officer	Radiation Control Techs	Waste Processing Team	Crane Operators	Saw Operators	Transportation Broker
Generic Qualification Training							
OSHA 40-hr HAZWOPER & 8-hr refresher as applicable	!	!	!	!	!	!	!
OSHA 8-hour Supervisor	!	!	!				
DOT HazMat Shipping							!
Physical Exam / Medical Fit for Duty	!	!	!	!	!	!	!
Respirator Qualified	!	!	!	!		!	
First Aid/CPR		!	!	!			
Asbestos Awareness	!	!	!	!		!	
Lead Awareness	!	!	!	!		!	
Site Specific Training and Qualifications							
BNL Contractor/Vendor Orientation (HP-Q006)	!	!	!	!	!	!	!
BNL Radiation Worker I (RWT002)	!	!	!	!		!	
Confined Space Entry	!	!	!	!			
Contamination Area (RWT300)	!	!	!	!		!	
on web BGRR Job-Specific EMS Training	!	!	!	!		!	!
on web Emerg Plan and Resp (GE-EMERGPLAN)	!	!	!	!		!	!
on web Environmental Protection (GE-ENV-GET)	!	!	!	!		!	!
on web Stop Work Procedure (GE-STOPWORK)	!	!	!	!		!	!
on web Rad Waste Generator (HP-RADIGEN)	!	!	!	!		!	
on web Hazard Waste Generator (HP-RCRIGEN3)	!	!	!	!		!	
Medical Surveillance Prog / Whole Body Count	!	!	!	!		!	
Respirator Fit Testing	!	!	!	!		!	
Chemical Hazard Monitoring Instruments							
Photo Ionization Detector		!		!			
Flame Ionization Detector		!		!			
MSA Explosimeter		!		!			
Oxygen Meter		!		!			
Radiation/Contamination Monitoring							
DOE RCT Core and BNL RadCon Procedures			!				
Bicron µRem Eberline RO-2 dose-rate meter (or equal)			!	!			!
Ludlum Model 3 with Pancake (â/ã) probe (or equal)			!	!			!
Ludlum Model 3 with alpha probe (or equal)			!	!			!
Sampling and Characterization							
Container Sampling		!	!	!			
Bulk/Soil Sampling		!	!	!			
Asbestos Sampling		!					
Sample Identification and Chain of Custody		!	!	!			!
Waste Mobilization and Processing							
Fluid Transfer Recovery System Operation						!	
Site Specific Manlift/Forklift Driver/Operator				!			

Overview of Training and Qualifications Requirements	Project Management	Site Industrial Safety Officer	Radiation Control Techs	Waste Processing Team	Crane Operators	Saw Operators	Transportation Broker
Certified Crane Operator					!		

Figure 3. Record of Training and Qualifications Requirements

Training and Qualification Record	Location	Date	Initials
Generic Qualification Training			
OSHA 40-hour HAZWOPER			
OSHA 8-hour HAZWOPER Refresher			
OSHA 8-hour Supervisor			
DOT HazMat Shipping			
Physical Exam / Medical Fit for Duty			
Respirator Qualified			
First Aid/CPR			
Asbestos Awareness			
Lead Awareness			
Site Specific Training Qualifications			
BNL Contractor/Vendor Orientation (HP-Q006)			
BNL Radiation Worker I (RWT002)			
Contamination Area (RWT300)			
on web BGRR Job-Specific EMS Training			
on web Emerg Plan and Resp (GE-EMERGPLAN)			
on web Environmental Protection (GE-ENV-GET)			
on web Stop Work Procedure (GE-STOPWORK)			
on web Rad Waste Generator (HP-RADIGEN)			
on web Hazard Waste Generator (HP-RCRIGEN3)			
Confined Space Entry			
Medical Surveillance Program/Whole Body Count			
Respirator Fit Testing			
Chemical Hazard Monitoring Instruments			
Photo Ionization Detector			
Flame Ionization Detector			
MSA Explosimeter			
Oxygen Meter			
Radiation/Contamination Monitoring			
DOE RCT Core and BNL RadCon Procedures			
Bicron microRem Eberline RO-2 dose-rate meter (or equal)			
Ludlum Model 3 with Pancake (â/ã) probe (or equal)			
Ludlum Model 3 with alpha probe (or equal)			
Sampling and Characterization			
Bulk/Soil Sampling			
Container Sampling			
Asbestos Sampling			
Sample Identification and Chain of Custody			
Waste Mobilization and Processing			

Fluid Transfer Recovery System Operation			
Site-specific manlift / Forklift Driver/Operator			
Certified Crane Operator			

14.0 RADIOLOGICAL WASTE GENERATED ON THE BNL SITE OTHER THAN THE DUCT SEGMENTS

The anticipated radiological waste streams generated by URS/D&M and its subcontractors on the BNL site other than the duct segments are as follows:

Waste Stream	Disposal Option
Liquid Cooling Water	Solidified or absorbed onsite at BNL during the cutting and segmentation operations. Sampling will be performed to determine a proper disposal site. The Industrial Landfill in Tennessee, Envirocare of Utah or DOE Hanford will be chosen by BNL management as the disposal site after the review of the Laboratory analysis, URS/D&M's recommendation and DOE approval.
Secondary Waste	Secondary waste (i.e., PPE, trash, discarded poly containments) will be created during cutting and segmentation activities. These wastes will be transported to US Ecology for processing. Sampling will be performed on the final waste volume to determine the proper disposal site. The Industrial Landfill in Tennessee, Envirocare of Utah or DOE Hanford will be chosen by BNL management as the disposal site after the review of the Laboratory analysis, URS/D&M's recommendation and DOE approval.

15.0 REFERENCES

BNL *Radiological Control Manual*, Rev 3.

BNL *Standards Based management System*.

ERD Operations Procedures Manual

Brookhaven Science Associates, *Specifications for Removal of the Above Grade Portion of the BGRR Primary Cooling Duct*, January 28, 2000.

URS-Dames&Moore. *Bid No. 34465: Removal of Above Ground Ducts, Proposed Technical Plan*. March 07, 2000.

URS Plans for the Above Grade Duct Removal Project
- Duct Cutting and Segmentation Plan
- Critical Lift Plan
- Quality Assurance Plan
- Waste Management Plan

Dames & Moore Group *Health and Safety Program and Management System*, June 1999.

Department of Energy Standards for Occupational Radiation Protection, 10 CFR 835.

Department of Energy Order, *Environmental Protection, Safety and Health Protection Standards*, DOE 440.1

Department of Energy Order, *Worker Protection Management for DOE Federal and Contractor Employees*, DOE 440.1A

ATTACHMENT 1

Compilation of Project-Specific Safety Management Standards
from URS-Dames & Moore
Health and Safety Program and Management System

ATTACHMENT 2

Subcontractor Statement of Compliance

ATTACHMENT 3

Safety Plan Compliance Agreement

ATTACHMENT 4

Daily Calibration Check Sheet

ATTACHMENT 5

Site Safety Briefing Report

ATTACHMENT 6

Air Monitoring Record

ATTACHMENT 7

Material Safety Data Sheets for Surface Contamination Fixatives